Independence Day 2021
Speech by Director, BARC

Dear colleagues, invitees, ladies and gentlemen,

It is matter of great honour and proud for me to stand on this podium and unfurl our beloved tricolour on the occasion of 75th Independence Day on behalf of the entire BARC family. It is my pleasure to greet everyone gathered here on this occasion as we pay our respects to the brave sons and daughters of our motherland who made innumerable and unimaginable sacrifices to achieve independence for our country. The great leaders who led us to freedom also laid the foundation for a vibrant and strong country, capable of catering to all the needs of its citizens. The importance of science and technology for fulfilling the aspirations of the new nation was envisioned by them, who established the temples of modern learning and great institutions for research and developmentacross the country.

My dear colleagues, last year has been very challenging not only for the BARC family but for the whole nation. An unprecedented pandemic has unleashed devastation in the world forcing us to step back and save ourselves. We lost some of our colleagues during this pandemic. I extend my heartfelt condolences to the bereaved family and friends. BARC will always remember the contributions made by them.

BARC has been continuing to focus its efforts on the strong research and development programmes,practically encompassing all the disciplines of science and engineering. The dedication of all our colleagues in BARC has ensured that we make significant progress even in the face of challenges posed by the pandemic.

I shall now highlight some of the notable accomplishments of our organisation in the front-end and back-end of fuel cycle.

1. Dhruva reactor continued to operate with a high level of safety with overall availability factor of 63.4%. 250 samples were irradiated for radioisotope production and 2 prototype dispersion fuel assemblies were irradiated at Dhruva reactor. Besides, Dhruva has also provided its services to the researchersfrom around the country for neutron beam research.

2. Apsara-U reactor was safely operated at 90 % of rated power with an availability factor of more than 90%.

3. Critical Facility for Advanced Heavy Water Reactor was operated on 34 occasions to test 15 neutron detectors and activation of 27 sampled for neutron activation analysis.

4. In the fuel fabrication front, the highest ever production rate of FBTR fuel was achieved to support raising the power of FBTR to 100%. Dhruva fuel and TAPS 1&2 Control Blade Assemblies were supplied as per required quantity. The Special Plate Facility (SPF) meant for the manufacturing the fission moly fuel plates, have been made operational.

5. A Neutron Irradiator System for fast and thermal neutron irradiation of specimen using Cf-252 neutron source has been developed and installed at RP&AD, BARC.

6. Post Irradiation Examination of Pressure Tubes from TAPS and KAPS was completed and the root cause analysis for the flaws observed have been completed.

7. Reprocessing, Waste Management and Fuel Fabrication Plants of NRB at Tarapur and Kalpakkam continued to function safely during Pandemic.

8. Vitrified Waste Storage Facility at Kalpakkam and Additional Spent Fuel Storage Facility (ASFSF) at Tarapur have been hot commissioned and are operational now.

9. Joule Melter at Kalpakkam completed 37 months of continuous operation. About 35% of the legacy waste accumulated at Kalpakkam since 1998 has been vitrified.

10. Sustained and efficient efforts for PP operations for the recovery of nuclear materials from Dhruva spent fuel resulted in NIL inventory of spent fuel.

11. Working on the philosophy of wealth from waste, about 1 lakh Ci of Cs was recovered and 6 kg of this has been converted to pencils for irradiation, 17 lots of 140mCi each carrier-free Yttrium-90-acetate solution were prepared for radiopharmaceutical applications, two Ruthenium-106 plaques were made and given to Army Hospital, Delhi for cancer treatment.

12. An indigenously developed Laser spectroscopy based Heavy water detection system is successfully deployed and tested in Dhruva Reactor. The instrument has the capability of real time monitoring of Heavy water concentrations of up to 5ppm in ambient air.

As part of our efforts in directed research a number of technologies have been developed to serve a variety of applications, a few which I would like to mention here.

13. A new compact technological product based on the principles of Nisargruna, has been developed and made available for small societies and eateries.

14. Infrared based skin temperature measuring device “TaapDarshak” has qualified COVID guidelines and deployed at 23 locations within and outside BARC for automatic thermal screening of visitors and employees. This technology has been transferred to a private industry for large scale deployment.

15. Indigenously developed fully suspended Turbo Molecular Pump using Active Magnetic Bearing was successfully operated at 24000 RPM giving satisfactory level of ultimate vacuum.

16. Brush-less DC (BLDC) Motors with various applications have been successfully developed for power levels up to 30 kW

17. Fabrication of BARC’s Scanning Electron Microscope has been completed and the system is operational giving resolution up to 20 nm.

18. In a step towards ‘Atmanirbhar Bharat’, technologies of high quality respiratory face mask, Engineered Valve-less Transparent Face Mask & Nuclear Grade Half Face Mask were developed based on HEPA filtration technology utilising indigenously developed glass fibre media. Technology for high quality respiratory face mask and nuclear grade half face mask was transferred for large scale production.

19. A one-meter long neutron guide unit having four Nickel-Titanium multilayer coated supermirrors has been developed. The supermirrors have transmission capacity of neutron beam greater than 94% that would lead to a 34% gain in neutron flux from the neutron guide. This in-house development is an import substitute to be used in neutron beamline at Dhruva.

20. A compact Thermal Ionization Mass Spectrometer (TIMS) based on 20cm electro-magnet has been developed indigenously for the precise isotopic ratio measurements. The instrument will be deployed at Fuel Reprocessing Division, BARC for measurements of isotopic concentrations of Uranium and Plutonium.

21. BARC has made many developments in the field of chemical sciences. A simple and cost-effective dissolved oxygen (DO) monitor,wide-field fluorescence microscope for determining position with nanometer accuracy along with orientation of emitting single dipoles and a simple visual colorimetric method for the estimation of

ethanol in ethanol blended petrol as well as in the alcohol-based hand sanitizers etc. are some of these developments.

I would now like to draw your attention to some of the other significant achievements in field of Basic Research.

22. The MACE gamma ray telescope, which was successfully installed at Hanle in Ladakh, in the year 2020 has now become fully operational. MACE had its first light from the Crab Nebula on April 01, 2021.

23. The Pelletron Accelerator has been consistently delivering a variety of ion beams round-the-clock to diverse users, despite the prevailing COVID constraints. The terminal voltage attained has been increased to 11.5 MV, resulting in enhanced beam energy and beta value for injecting into Linac Booster.

Our R&D efforts in material science has resulted in development of many special materials, a few of which I would like to highlight here.

24. A calciothermic reduction process has been developed for the first time in India to produce dysprosium metal to prepare higher grade NdFeB magnets

25. An ultra-sensitive label-free CNT based bio-sensor has been developed for rapid detection of DNA hybridization with a limit of detection of 1 pico-molar in less than 20 minutes.

26. In an effort to develop concrete material having better properties, a composition of graphene oxide mixed concrete has been formulated which has shown 40% higher compressive strength.

27. Technology for preparation of high purity zirconium di-boride powder using borocarbothermic reduction technique has been developed to make Borated Zirconium Alloy.

28. The technology for production of boron carbide powder with a capacity of 3 tonnes per annum has been transferred to a private entrepreneur.

Our persistent efforts towards meeting the societal needs in healthcare, agriculture, water, environment etc. have been continued. BARC has developed a number of technologies in this direction, a few of which I would like to mention here.

29. Two rice varieties, Vikram-TCR and CG Jawaphool Trombay, were gazette notified and 2 more varieties, Trombay Chhattisgarh Vishnubhog Mutant (TCVM) and Trombay Chhattisgarh Sonagathi Mutant (TCSM), were released having higher yield.

30. A very successful eco-friendly and biodegradable BARC-hydrogel has been further improved to achieve water absorption up to 550 times of its own weight.

31. Food preservations technologies developed for Jamun product, Sprouts & Sweet Corn Kernels, Stuffed Baked Food, Intermediate moisture shrimp, Fish soup powder as well as Foldable Solar Dryer

(FSD) have recently been transferred to different firms for commercial deployment.

32. A cancer diagnostic radiopharmaceutical ligand prostate-specific membrane antigen PSMA-11 has been synthesized.

33. RMC this year has commenced the Alpha Peptide Receptor Radionuclide Therapy (PRRT) which is suitable for small cell cluster tumors. The first Actinium- 225-DOTA-TATE for neuroendocrine tumours (NET) and the first Ac225-DOTA-PSMA-617 for prostate cancer were prepared and administered to patients. RMC has been offering Lutetium-177 PRRT and Yitrium-90 PRRT for moderate size to large size tumors respectively. With addition of Ac-225 PRRT, RMC has now therapy available for the entire spectrum tumor sizes.

34. Under the DAE Project on “Deployment of water purification technologies in 50 villages in India”, which is in alignment with the Jal Jeevan Mission of Government of India, a 2000 LPH capacity fluoride removal plant, catering to 4 villages, was installed, commissioned and handed over to the Sagargaon Gram Panchayat in Khordha District of Odisha.

I would also like to draw your attention to some of the other noteworthy developments by our centre.

35. Several new initiatives were taken to make the medical facility available to all beneficiaries. These included; facility of

teleconsultation at dispensaries, installation and functionalisation of ICMR approved Virology lab for TruNat testing and Covid related research activities in the area of sero-surveillance and seroprevalence. The new wing of BARC Hospital was inaugurated on 29th June, 2021. The vaccination programme currently underway at our hospital has benefited our employees in a big way. It is also worth mentioning that over thirty-five thousand anti-Covid vaccines doses have been administered at our hospital so far.

36. As a part of our efforts of broadening the scope of eOfficeimplementation, secured access to various portals of BARCas well as to document sharing system was provided to employees.

37. More than 97% overall availability of all Civil, Electrical, HVAC, Mechanical utility services & security systems and L&CM was ensured.

38. The Mobile friendly version of BARC official website with new technology features was officially launched by Chairman AEC on 27th April 2021.

39. BARC has released the document on *wireless policy*whichformulates the information security aspects of using wireless communication inside BARC, Trombay and the procedure to obtain permission for usage of wireless equipment for research purpose. This is the first time a policy document on wireless usage has been issued in DAE.

40. It is important to mention that even within the constraints of the restrictions of the Covid pandemic, BARC has successfully organised National Science Day as well as National Technology Day celebrations. Major sessions of the events of these celebrations were held in virtual mode.

I will be happy to mention two important international recognitions of our colleagues of Bio-Science Group

41. Mutation Breeding Team of Bio-Science Group has been awarded OUTSTANDING ACHIEVEMENT AWARD by IAEA, Vienna in recognition of radiation based mutation research for genetic improvement of crops resulting in the release and notification of 11 varieties in the last decade.

42. Shri P. Dhanasekar of Nuclear Agriculture and Biotechnology Division, BARC has been conferred the YOUNG SCIENTIST AWARD by IAEA, Vienna in recognition of his dedicated mutation breeding research in the release and notification of four high yielding, disease resistant mutant for commercial cultivation.

Dear colleagues, the achievementspresented in this address are just a few highlights of our accomplishments in the very recent times. They represent the collective effort of all our employees who have contributed in equal measure to this large team effort. I urge them to continue to serve the organisation with the same spirit of teamwork and cooperation which has fetched rich dividends to the organisation and the nation.

BARC Hospital and its dispensaries has always played crucial role to ensure the best possible care for the all the CHSS beneficiaries. Medical Division has been working relentlessly throughout the year rendering uninterrupted services to our employees. The challenges posed by ongoing second peak of Covid are being effectively managed. I convey my gratitude to all the front-line workers for their services.

I would like to acknowledge the important roles played by Administrative Group, Engineering Services Group, BARC Safety Council, BARC Security, Anushaktinagar Security, CISF, Public Relations Office, Fire Services Section, Landscape and Cosmetic Maintenance Section, Transport & Catering Services Section and many more, who individually and collectively facilitated the smooth functioning of the organisation. Special thanks are due to BARC Workers and Staff Unions for their support and cooperation. I am also thankful to all the personnel of BARC Credit Society, State Bank of India and Indian Post who are stationed at our campus and have been providing good services to our employees.

As we approach the completion of 75-year independent nation, let us commitourselvesto the development of our country in a truly self-reliant - “AatmaNirbhar Bharat”.

While concluding my speech, I once again extend my greeting to all.

Thank you &Jai Hind