

Dignitaries, invitees, colleagues, ladies and gentlemen, it is an honour and privilege to hoist the national flag on the occasion of the 73<sup>rd</sup> Independence Day of India on behalf of the entire BARC fraternity. I take this opportunity to extend my greetings to all gathered here for this solemn occasion.

We are all aware of the great struggles and sacrifices our leaders and forefathers had to make to gain a hard-fought freedom from colonial imperialism. This is certainly an occasion to pay tribute and homage to all brave sons of India. But this is also an occasion to rededicate ourselves to a brand of active patriotism which extends beyond the mere symbolism of flag hoisting and encompasses a whole gamut of actions and duties which we should perform in the national interest. As a community of scientists and technologists, we need to develop and deploy technology not only to solve problems of the nuclear sector but also address the larger societal issues. Our organisation has always been a living symbol of this paradigm which has been built into our ecosystem by our visionary founders.

One of the main thrust of our activities has always been the strong research and development programmes in all disciplines of science and engineering. We have an excellent track record in terms of quality and quantity of scientific and technical publications with average citation index, h-index and number of publications being consistently high as seen in a recent analysis. However, even more importantly, we have equally excelled in the deployment of our research outputs towards the development of systems, processes and facilities for a variety of applications, with a combination of knowledge, skills, expertise and innovative thinking. I shall now be presenting some of the important activities and achievements of our organisation during the last one year to illustrate and highlight this aspect of our organisational mandate.

At the front end

1. The newly commissioned Apsara-U reactor was operated at 90% of rated power after achieving first approach to criticality on September 10, 2018. Trial production of radioisotopes including carrier free Cu-64 radioisotope for use in PET scan has been commenced.
2. The committed target of 30.0MT nuclear grade Uranium metal has been met and supplied for fuel fabrication. The Uranium metal ingot batch size has been successfully augmented to 1000 kg/batch with an improved recovery of 98% uranium.
3. 250 kilograms of nuclear grade gadolinium nitrate hexa hydrate was prepared and supplied to NPCIL for use in indigenous 700 MW Pressurized Heavy Water Reactor KAPP-3&4 as burnable poison material in the reactivity control and reactor shut down systems.
4. At the back end, reprocessing plant of NRB at Tarapur achieved a major milestone in its cumulative output in the month of July this year. The reprocessing plant at Kalpakkam is back on line after a major maintenance shutdown and continues to operate at its rated capacity. Joule heated Ceramic Melter, hot commissioned in December 2017 at WIP Kalpakkam continues to function without any stoppage.

As mentioned in my preamble, I shall now be enumerating some of the facilities, systems, devices and processes developed and deployed for a variety of applications, beginning with some important facilities established during this period

5. The Low Energy High Intensity Proton Accelerator, LEHIPA, has been commissioned to the full RFQ energy of 3 MeV, with an accelerated beam current of 1 mA, and was run continuously for over 2 months. This is the first high intensity proton LINAC in the country, and marks an important milestone in the national accelerator programme.

6. A pilot plant facility of 15 Kg/batch capacity for the recovery of cobalt from Spent Ammonia Catalyst was transferred to Heavy Water Board for processing of spent catalyst stored at their facilities.
7. An experimental facility mini-ISM-RAN- **Indian Scintillator Matrix for Reactor Anti-Neutrino** detection has been deployed for measurements on reactor anti-neutrinos with the reactor in the running and shut down conditions. A full-fledged ISMRAN system with many fold increase in sensitivity is under development based upon experimental data gathered.

Numerous systems have been designed, developed and fabricated to serve a variety of applications

8. The ergonomic design for a fully automated PC controlled carbon-sulphur analyser (CS analyser) for the simultaneous determination of carbon and sulphur in solid samples has been completed and the prototype made ready.
9. Big-Data Analytics platform has been developed for passive network security monitoring of Internet/Intranet traffic at the centre. It is being used for detection of malware activities and continuous tracking of data ex-filtration activities involving large file uploads/downloads and other cyber-security tasks.
10. Installation of a cryogen free 300 mm diameter warm bore indigenously developed superconducting solenoid magnet for magneto-hydrodynamic studies has been completed.

Amongst some of the devices, processes and technologies deployed during recent past, a few which I would like to mention are as follows

11. Sixteen numbers of highly sensitive indigenously developed Hydrogen Sensors were delivered for Liquid Sodium loop of FBTR.

12. An efficient process for recovery of hafnium oxide has been developed for use at NFC which is an example of generating resources from waste in an environmentally friendly manner.
13. Technologies for the production of tungsten metal powder by hydrogen reduction and the production of Tungsten heavy alloys by cold compaction and high-temperature sintering have been successfully developed and transferred to a private enterprise.

The mandate towards societal applications in healthcare, agriculture, water, environment etc. has been addressed by delivering the following technologies for this purpose

14. A biodegradable polymer based chlorine dioxide releasing technology, named CLEAN has been developed for “on demand” water disinfection through in situ generation of ClO<sub>2</sub>. The technology can be deployed for obtaining pathogen free water at remote locations.
15. A visual detection kit for the estimation of toxic levels for mercury in drinking water/ground water has been developed. The method can detect mercury up to a lower level of about 1 ppb, while a level >2 is considered to be toxic for drinking water.
16. A ready-to-use clinical formulation of <sup>177</sup>Lu-HA has been developed for radiation synovectomy in the treatment of inflamed medium sized joints such as elbow, ankle and wrist for the reduction of pain and swelling. The product has been approved by Radiopharmaceutical Committee (RPC) of DAE for its regular formulation and supply to hospitals for treatment.
17. BARC in collaboration with Ahmedabad Municipal Corporation (AMC), has set up a Technology Demonstration Pilot Plant for Sewage Sludge Hygienisation at Shahwadi, Ahmedabad. The plant loaded with 150 kCi of Co-

60 was inaugurated in February 2019 and is in continuous operation since then.

18. Irradiated chitosan treatment, jointly developed by BARC and Vasant Dada Sugar Institute, Pune has been recommended for commercial application by the Joint AGRESCO of Maharashtra Agriculture Universities, for increasing crop productivity.
19. An eco-friendly protocol for increasing the shelf life of mangoes stored in cold storage facilities has been developed and successfully tested for the preservation of Kesar mangoes for upto 40 days.
20. 10 numbers of Ru-106 plaques for eye cancer treatment have been fabricated from purified Ru-106 recovered from radioactive waste. A leading hospital is currently involved in the performance evaluation in the treatment of eye cancer.
21. A plasma based incineration facility has been commissioned with actual waste at 25 kg/hr capacity for processing of mixed cellulosic, rubber and plastic waste with negligible possibility of toxic gas generation which is a concern in the conventional incineration. The facility is the first of its kind in the country.

I would also like to draw your attention to some of the other noteworthy developments and achievements which are as follows

22. BARC has recently been recognized by the National Accreditation Board for Testing and Calibration Laboratories (NABL) with the “Certificate of Accreditation”, authenticating the competence in chemical testing for “Metals & Alloy” and “Water”. The certificate is valid up to 19th March, 2022.
23. Towards appropriate manpower development for augmenting Nuclear Medicine services, two new post-graduate courses viz. (i) Nuclear Medicine

& Molecular Imaging Technology, & (ii) Hospital Radiopharmacy are being introduced, the latter being the first in the country.

24. Dr. S. Patwardhan Raghavendra has been awarded with Young Scientists Indian National Science Academy Award for developing a plant based radioprotector formulation for applications in lowering the risk of normal tissue radiation toxicity in cancer treatment. The work has been granted a US patent and is being incubated with a pharmaceutical company for deployment.
25. BARC has been awarded with Rajbhasha Shield -Second Prize for three consecutive years in the category of central government offices for excellent implementation of Official Language for the year 2016-17, 2017-18 and 2018-19 by TOLIC-Navi Mumbai.

Services, Infrastructure and safety are crucial for the smooth functioning of the organisation and it is noteworthy that Engineering Services Group achieved more than 97% overall availability of all Civil, Electrical, Mechanical utility services and security systems over this period. BARC is committed to ensure radiation safety of the occupational workers, public and the environment, which is strictly monitored and implemented by the BARC Safety Council. All nuclear fuel cycle facilities and research facilities of BARC operated with high safety performance during this period.

The participation and contributions of our auxiliary services and support personnel is vital for our functioning and I gratefully acknowledge their contributions towards the success of our programmes. This includes the services provided by the Administrative Group, Medical Group, Engineering Services Group, BARC Safety Council, Scientific Information Resources Division, Accounts Division, Public Relations Office, Security Section, Fire Services Section, Landscape and Cosmetic Maintenance Section, Transport Section, Catering

Services Section and many more, who individually and collectively contributed to the smooth functioning of the organisation.

Special thanks are due to BARC Workers and Staff Union for their support and cooperation in our endeavours.

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 provide services to our employees

At the end, I would like to appeal to all the employees that they should continue to put their best efforts in the same dedicated manner with a spirit of teamwork and cooperation. I would like to assure all the employees of this great organisation that we place equal value to the services of each individual serving at this centre and request them to consider this as a personal acknowledgement and appreciation of their individual contributions.

Thank you and Jaihind