

65th Anniversary of the Independence Day

Wednesday, August 15, 2012

Text of Address by Shri. Sekhar Basu, Director, BARC

Dear colleagues,

Let me first extend my hearty greetings to you all on the occasion of the 65th anniversary of the independence day of our country. We have assembled here today to take a collective pledge to preserve the honour and dignity of our national flag, to pay homage to all those who made supreme sacrifices for the sake of freedom of our country and to rededicate ourselves to keep the national interests uppermost in all walks of our professional and personal life. Let us also collectively salute the members of our armed forces, who vigilantly protect our country, as well as all the other security- related personnel, who are striving to ensure the security and safety of our society.

BARC's mandate is multi-faceted covering nuclear energy and nuclear fuel cycle, research reactors, radioisotope production and radiation applications, various advanced technologies associated with these programmes, basic science and applied research, and strategic activities. BARC's overall achievements and progress are too large to be listed here today; let me try to give only a few examples of our developmental work and achievements during the recent past and then touch upon some more areas, which are also equally important (*Note: The text following here contains some more points beyond those covered in the speech delivered at the event*).

Reprocessing

Reprocessing programme has seen a turn around and has achieved all time record in capacity utilization. The plants at Kalpakkam and Tarapur have been operating satisfactorily and safely.

R&D Support and Other Services to Power Plants and Nuclear Facilities

- BARC Channel Inspection System for in-service inspection of coolant channels of 540 MWe PHWRs has been commissioned at Tarapur and in service inspection of 16 coolant channels of TAPS-4 has been carried out. In service inspection of BWR pressure vessel seam and circumferential welds was carried out with technology developed at BARC.

- Post irradiation examination and failure analysis support were extended to several reactors of NPCIL and Dhruva reactor. Evaluation of hydrogen and deuterium contents of pressure tube sliver samples received from various reactors of NPCIL was carried out towards assuring coolant channel integrity.
- Asymmetric PHWR pressure tube (PT) ballooning experiments were conducted simulating stratified coolant channel during severe accident scenario.
- Life management tools were developed for PHWR pressure tube inspection.
- A pilot scale fluidized bed thermal denitration plant of 30 LPH capacity has been commissioned with 300 NB denitration reactor for development of thermal denitration process for different nitrate streams of nuclear fuel cycle.
- Radiometry testing of Super Heavy Density Concrete (SHDC) of 4.2 g/cc test blocks from NPCIL has been carried out to standardize the fabrication procedure. Radiometry testing was also carried out for the Advanced Vitrification System -II (AVS-II), Tarapur and the Waste Immobilization Plant at Kalpakkam (WIP-3A) for checking shielding adequacy of the cell walls.

Environmental Monitoring and Radiation Safety

- The Environmental Radiation Monitor (ERM) developed in BARC has been integrated with the Automatic Weather Station system developed by ISRO and is being mass produced for large scale deployment.
- Two DAE Emergency Response Centres (DAE-ERCs) were established at Manavalakurichi (Tamilnadu) and Chatarpur (Orissa), making it 22 DAE Emergency Response Centres in the country, to respond to any nuclear and radiological emergencies in public domain. Radiation detection systems were installed in 10 Mumbai Police patrolling vehicles for detection of any unauthorized movement of radioactive material.
- Over 1.4 lakh newborns were screened from normal and high level natural radiation areas of Kerala coast. The frequency of still birth, major malformation and down-syndrome did not show any significant differences in control and exposed population.

Waste Management

An innovative process has been developed and deployed for the treatment of legacy intermediate level liquid wastes stored in plutonium plant, Trombay. About 150 cubic meters of stored waste has been successfully treated at WIP, Trombay.

Research Reactors

- Dhruva, currently the only reactor facility available for radioisotope production, has continued to operate, with a high level of safety and availability, as a major national facility for neutron beam research.
- Activities pertaining to the up-gradation of the Apsara reactor to a 2 MW reactor with a new core are in progress. Detailed project report of the new high flux research reactor has been submitted for safety review. There is also a project proposal for construction of another new reactor having design features similar to Dhruva.

Advanced Reactor Technologies

- Design information reports of various structures and systems of AHWR have been handed over to the consultant for detailed engineering. Work has started with design of civil structures and 3-D layouts have been generated. Test Facilities such as AHWR Thermal Hydraulic Test Facility (ATTF) and Fuelling Machine Test Facility (FMTF) are being set up at Tarapur for verifying the thermal margins and for performance testing of the fuelling machine.
- Trials were taken for preparation of TRISO coated fuel with UO₂ kernel for use in CHTR. Test irradiation of the fuel is being planned at FBTR.

Physics

- A mirror-less photonic crystal laser – a tiny laser – has been developed for the first time in the world.
- Dye-sensitised solar cells having better than 6% efficiency have been developed.

Chemical and Radiochemical Sciences

- Analytical methods have been developed for the trace and bulk characterisation of ¹⁰B enriched boron carbide pellets, for control rods for use in PFBR.

- In the picoseconds accelerator development, a 65 MW modulator power supply for 25 MW klystron working at 10 Hz repetition rate and pulse forming network device has been completed in collaboration with RRCAT.
- Pulsed neutrons emitted from a plasma focus (PF) device, developed in house, have been used for the first time for non-destructive assay of ^{235}U content in different chemical forms (oxide, metal).

Materials and Fuels

- Hexagonal shapes of structural grade beryllium for application in PFBR as a photo-neutron source has been fabricated and precision machining done to the required tolerance. The Be blocks produced in the BARC facility have been qualified and certified by the Quality Assurance Group of BHAVINI for use in PFBR
- For PFBR, a consignment consisting of 8200 enriched boron carbide pellets was segregated into 171 stacks; the supplied material met all the quality parameters for control rod applications.
- Uranium based CERMET fuels were fabricated. The homogeneity of microstructure was verified using energy dispersive spectrometry and density obtained was over 70% T.D.
- The technology for making shape memory alloy components for Indian LCA (Tejas) has been transferred to M/s. Hindustan Aeronautics Ltd. who have set up a production plant at their Foundry & Forge Division in Bengaluru.

Nuclear Agriculture

- A confectionary large seed Trombay groundnut variety, TG 47 (Bheema; RARS T-1) with 115 days maturity has been released and notified for commercial cultivation for irrigated conditions in all agro-climatic zones of Andhra Pradesh, bringing the total number of BARC (Trombay) crop varieties released and notified by Government of India to 40.

- Towards dissemination of Trombay groundnut varieties, BARC has produced 37 metric tonnes of quality (breeder) seed and distributed to several seed agencies including farmers.
- About 140 Nisargruna plants are currently functioning for the treatment of biodegradable waste. Karnataka government has recently recommended BARC Nisargruna technology for decentralized waste management.

Food Technology

- BARC has developed a technology for long-term preservation of fresh litchi fruit and demonstrated to farmers in Maharashtra; technology transfer has also taken place.
- At KRUSHAK Irradiation facility in Lasalgaon, 220 tons of mangoes were processed this year for export to USA, the second largest export in the past six years.

Health

- Technology of Digital Radiotherapy Simulator was transferred to a private company in Bengaluru for commercialization of the machine.
- Indigenous capability to produce the radiopharmaceutical product called ^{99m}Tc -tetrofosmin, suitable for myocardial perfusion studies for detection of coronary artery diseases, has been developed.

Water Resources and Management

- TSD has taken a major step in the water conservation programme by way of utilizing rain water to meet the requirement of Central Air-conditioning Plant of BARC. A novel concept of utilizing the rain water from Lake No.11 situated in the Trombay foothills for the makeup water requirement of cooling towers has been successfully implemented for harvesting around 300 million litres per annum of rain water resulting in considerable cost savings.
- Multistage Flash Distillation based Desalination Plant at Kalpakkam achieved full capacity.

- A basket of membrane based desalination and water purification technologies has been transferred to one of the leading industrial house of the country for expanding the deployment potential.
- Online domestic water purifier technology was transferred to a 25th party in the country. Lakhs of units have been sold in rural and urban areas. It has provided direct and indirect employment to several hundreds of people.
- An Isotope Hydrology Laboratory with advanced equipment has been set-up at the Himalayan Environmental Studies and Conservation Organization, Dehradun to train the local people and help build capacity to undertake spring recharge related studies.

Electronics, Instrumentation and Other Advanced Technologies

- Development and delivery of a variety of sensors have been completed for compact LWR programme.
- A 100 metre long 30kA hybrid Nb-Ti based CICC fabricated on a 2 m diameter bobbin using innovative indigenous technology was flagged off on the 2012 National Technology Day from BARC to Institute of Plasma Research, Gandhi Nagar for use in the Fusion Programme.
- In the Indian Test Blanket Module development for ITER-MHD, experiments with lead-lithium liquid metal at high magnetic field have been completed on three BARC test sections at the Institute of Physics Latvia (IPUL) jointly by BARC, IPR and IPUL.
- BARC has designed, developed and deployed the Secure Network Access System (SNAS) to effectively address the requirement of sharing information with “intent and purpose”, by monitoring whether a registered user conforms to the ‘policy and profile’ of usage. This technology has been transferred to the Electronics Corporation of India Limited, Hyderabad for marketing this product for use at strategic institutions at National Level.
- For Cargo scanning applications, the sub systems of the 3/6 MeV dual energy RF electron linac have been developed, integrated and are being tested. This prototype, suitable for mounting on a mobile platform, will be taken up for production by ECIL.

- A compact repetitive Linear induction accelerator rated 400keV, 100ns, 300Hz to deliver 1.6 GigaWatt of pulsed power has been assembled, integrated and tested. The accelerator will be used for High Power Microwave generation.
- A sophisticated system of Hexapod along with Ultra High Vacuum (UHV) Chamber (for housing the 1.3M long X-ray mirror) was designed, manufactured and installed (involving assembling, testing, calibration) by CDM at the Scanning Type EXAFS Beamline of INDUS-II, RRCAT.
- A high current, state-of-the-art superconducting ECR ion source has been commissioned and ^{238}U beam of charge state 34^+ was extracted from the ion source during beam trials.
- Advanced Solar Energy Collector based on array of line focusing reflectors and overhead line cavity receivers has been successfully commissioned at IDEMI, Mumbai, giving 8 kW power.

Security and Physical Protection

Security of our Centre is a matter of paramount importance at all times. BARC security and CISF personnel have been performing a commendable task of providing the physical protection of our establishment. I wish to express also appreciation of the BARC Fire Service personnel for their role in the protection of the various establishments of our Centre. I am sure my colleagues will continue to remain vigilant and alert at all times in matters related to safety and security.

Medical, Administrative and Landscape and Gardening Services

I wish to warmly acknowledge the contribution of our large network of vital services. They include, Engineering Services Group for their numerous services; Medical Division, BARC for providing healthcare facilities to the entire Mumbai-based CHSS beneficiaries (over 85000); Administrative Group who take care of all functions in the fields of administration, establishment, man power planning, personnel data management and finance and accounts; and to the Landscape & Floriculture Section for the beautiful ambience of this venue and our gardens.

Closing Remarks

I am happy to inform that we now have a logo for BARC which symbolises the spectrum of our mandate and objectives; also, a brochure “BARC at a Glance” has been published earlier this year. Our programmes and deliveries directly address nearly all sectors of societal needs, including food, water, environment, energy, healthcare, industry, education and national security. BARC’s R&D performance is also very impressive and in 2011, BARC published 1415 papers. Over these years we have achieved a lot, but much more is needed to be done. We have to improve our performance both in quantity and quality with higher level of commitment and discipline. I suggest you give some suggestions towards this, to my email id ‘suggestions’.

Finally, on this special day, as we salute our freedom fighters, who gave us this free country, let us pay our tribute to them by rededicating ourselves to continue our pursuit of excellence in frontier areas of science and technology for the betterment of the quality of life of the people of our country.

Thank you and Jai Hind.