Founder's Day Address
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by
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Dr. R.K. Sinha, Chairman, AEC, Senior Members of the DAE Family, Distinguished Invitees, Representatives from Media, my dear Colleagues and Friends,

I extend warm welcome to all of you to this Founder's Day functions. Today, we will collectively pay respectful homage to our visionary Founder, Dr Homi Jehangir Bhabha, on his 105th birth anniversary. This year's Founder's Day is also very special for us, since our Department of Atomic Energy, founded on August 3rd, 1954 entered in to its Diamond Jubilee year.

We have assembled here to reflect upon our performance and achievements in the past year, and rededicate ourselves to continue to make the best efforts in ensuring maximum benefit to the nation from nuclear science and technology and their multi-fold applications.

To begin with, let me tell you, about the performance highlights, and some specific achievements of BARC during the last one year.

A.1 Two VVIPs visited BARC during this period. On November 15th, 2013 the Hon'ble President of India graced the Graduation Function of the 56th Batch of BARC Training School and later the Hon'ble Prime Minister of India visited BARC on July 21st, 2014 for first-hand familiarisation with DAE - BARC programmes and projects.

A.2 The year 2014 is a year of milestones for BARC. On August 18, 2014, the Golden Jubilee Celebration was held to commemorate the commissioning of Plutonium Plant (PP) and we completed 40 years since the first peaceful nuclear explosion on May 18, 1974 at Pokran.

Dear Colleagues,

BARC continued its support to NPCIL for continued operation of their reactors.

B.1 After performing inspection of welds in the upper region of Reactor Pressure Vessels of TAPS 1&2 a manipulator has been developed for core belt inspection.

B.2 Post Irradiation Examination (PIE) of pressure tube from Q-10 coolant channel of KAPS-2 reactor and garter springs were completed.

Today we are focusing our activities towards deploying the outputs of our R&D efforts in our high technology activities. I would tell you about some of them related to reactors.

C.1 PARTH, an integral test facility, set up jointly with NPCIL, simulating AHWR Heat Transport System, Steam and feed water system, Emergency core cooling system and associated controls has been commissioned for operation at low power.

C.2 A piping loop, with a notch machined on one of the highest stressed welds, was subjected to a shake-table test with increasing levels of acceleration. The piping could withstand 40 events of Safe Shutdown Earthquake level. I am glad to announce that this test has been chosen by OECD/NEA as a benchmark exercise in the framework of the Metallic Component Margins under High Seismic loads (MECOS) project.

C.3 The first version of the molten fuel - coolant interaction code, PINAK, has been jointly developed by BARC and Neptune Laboratory, Jadavpur University. The code addresses issues related to the effect of single channel failure on the other channels under accident conditions for PHWRs.

C.4 Palladium-platinum catalyst panels, developed for hydrogen mitigation under severe reactor accidents, were tested at Hydrogen

Recombiner Test Facility of NPCIL. The H_2 removal rate is on par with that of the commercial catalyst from Europe.

C.5 For prompt detection and identification of earthquakes that could be tsunamigenic, a software has been developed and system has been installed at the data centers to monitor earthquakes in Andaman, Nicobar and Sumatra Regions of Indian Ocean / Bay of Bengal.

C.6 Public dose assessment from the proposed projects of NPCIL at Jaitapur, Gorakhpur, Chutka and Mithi Virdi, have been carried out. Public dose assessment for reactors and other facilities at Vizag was also completed.

C.7 Commissioning of Large Pool Fire Test Facility (4m x 4m) at Jain-University, Bangalore was completed. Most of the transportation packages used in our country can be certified by using this facility.

Dear Colleagues,

Our back end facilities continued to perform well.

D.1 Advanced Vitrification System (AVS) at Tarapur achieved the milestone of producing 150 VWP canisters (16 Te) within two years of operation.

D.2 Since its hot commissioning, Actinide Separation Demonstration Facility (ASDF) at Tarapur is being run regularly in campaign mode as per the requirement of the users.

D.3 One full tank containing ILW at PP was treated during this year.

Technology development in the following areas will boost the back end activities:-

E.1 Two types of under-water manipulators of 9 kg and 25 kg payload capacities have been supplied to the reprocessing plants at Tarapur and Kalpakkam for under water handling trials of spent fuel bundles.

E.2 An efficient air-plasma-torch, using ambient air as plasma gas, hafnium electrodes, producing a long jet, high temperature (~80000C) plasma at 30 kW power has been developed for the first time. This is being installed at the radioactive waste incinerator of Nuclear Recycle Group.

E.3 A highly sensitive method, called Differential Die Away technique, of detecting fissile material in waste drum and hull has been developed. Using a pulsed neutron source, 500mg of Pu could be detected in 150 kg of Zircaloy hull in the presence of active gamma and neutron background.

We have seen some important developments in the field of High Energy Physics.

F.1 MACE, India's largest telescope (21 M dia) for Gamma Ray astronomy, completed trials at ECIL Hyderabad. It is now being shifted to Hanle in Ladakh for installation.

F.2 The Imaging beamline at Indus-2 synchrotron, which is a micro-imaging facility for material and bio-medical research, has been commissioned.

F.3 The Infra-red beamline at Indus-1 synchrotron has also been commissioned for materials science studies.

F.4 50 RPCs and 200 Cooling panels made at BARC were installed and commissioned in May 2014 at Large Hadron Collider (LHC), CERN in Compact Muon Solenoid (CMS) experiment which is getting ready for the collisions at 14 TeV from 2015.

Significant progress was also made in the data processing and networking field both in software and hardware.

G.1 A new parallel processing supercomputer, ANUPAM-Aggra with peak performance of 150 Teraflops and sustained performance of 109 Teraflops has been commissioned.

G.2 A cloud computing service named "Megh" has been developed to provide computing infrastructure to BARC Intranet users. It has 1024 computing cores, 4 Terabytes of RAM and 128 terabytes of disk space. Using this service, users can create servers on demand according to their requirements.

G.3 A new projector based seamless tiled display has been developed for graphics data visualization. This system consists of 9 LCD projectors arranged in a 3x3 tiled fashion, projecting their images on a screen. Absence of seams between individual screens gives smooth break-free images. The new display system also has the ability to display graphics content in 3-D using Active Stereoscopic glasses.

G.4 Software named "MARG DARSHAK" has been developed which provides a 3-D walkthrough model of buildings. It is useful for training of security personnel and response forces for protecting vital installations.

G.5 As part of ongoing collaboration with ECIL to develop & deploy, secure, indigenous network components, ECR series routers have

been successfully integrated in NKN network and in MTNL's commercial network. A pilot video surveillance system based on these routers was also integrated.

Dear Colleagues,

We continued to contribute in multiple areas of defence applications.

H.1 Nine types of process sensors required by the compact LWR propulsion plant have been successfully indigenized and technology transferred to ECIL.

H.2 Nuclear Instrumentation and radiation monitoring systems were designed, developed and commissioned at P4 for Cold and Hot criticality experiments. Gamma scanning machine developed in BARC was used for scanning fuel bundles, for post irradiation burn-up studies, isotopic analysis and quantitative measurements.

H.3 In-house developed high neutron sensitivity Helium-3 detectors have been used to monitor the reactor core neutron flux in P4 hot facility.

H.4 Under the collaborative programmes with ECIL for development of strategic electronics technologies for defence, three stabilization and tracking servo systems were delivered to ECIL for further integration. These include:

- 0.45 metre dia SATCOM terminal for onboard deployment in Indian Airborne Early Warning System (AEWS) of DRDO
- Two axis gimbaled X-band Seeker for Brahmos missile
- 0.73 metre SATCOM terminal for on-board deployment in Rustum Unmanned Aerial Vehicle (UAV) for DRDO.

H.5 Operational Nuclear Nomograms have been designed, developed and implemented on a Rugged Tablet PC, as a hand-held tool for training and use by the Defence Forces to assess the impact of a nuclear strike.

In the field of fuel fabrication, development took place in the following areas:

J.1 A Glove Box set-up has been made ready for fabrication of Mechanically Bonded Metallic fuel pin for irradiation testing at FBTR.

J.2 Up-gradation of Metal Reduction Technology & Effluent Handling Facility has been commissioned for production of nuclear grade Ammonium Diuranate (ADU) for utilization of the U-scrap generated during fuel fabrication.

J.3 To increase the available reactivity in Dhruva reactor modified fuel clusters with two different Uranium loadings were fabricated and are being irradiated.

J.4 As a part of our technology development for thorium based fuels, irradiation of (Th-Pu) MOX fuel assembly to a burn-up of 20 GWD/Te was completed successfully at DHRUVA and a new (Th-LEU) MOX assembly was installed in pile.

Now, I would like to tell you about some more areas, where our technology development efforts were successful.

K.1 An indigenously developed mine Ventilation Control System operating through feedback of real time levels of radon and noxious gases, has been installed at Underground Uranium Mine, Turamdih.

K.2 Our efforts towards the purification of germanium have reached 8N level of purity and 2 kg material was delivered for detector development.

K.3 Design and development of a 1.7 Tesla Electromagnet and its power supply for corrosion loop experiments for ITER-TBM was completed and magnet was delivered to IPR, Gandhinagar.

K.4 BARC has developed an online steam turbine blade vibration monitoring system. In April 2014, NTPC was able to predict blade failure in Tanda power plant in UP using this portable system.

K.5 An atomic magnetometer cum atomic clock, a first-of-its-kind, has been developed. While providing an atomic frequency standard with stability of about ~10^{-9}, it can simultaneously measure ultra-low magnetic fields with pico-tesla sensitivity.

K.6 Two units of electromagnetic manufacturing machine of 40 kJ capacities, which is sufficient for most of the industrial jobs, have been built under a technology transfer to ECIL.

K.7 A compact electron welding machine suitable for glove box application has been developed and deployed.

Dear Colleagues,

We continued to support the space programme in many areas:

L.1 A set of sensors and associated components have been delivered to ISRO for launching in the Langmuir probe payload, in SRE-II spacecraft. These sensors will be used for diagnostics of the plasma that is generated during re-entry and resolve the issues related to RF blackout.

L.2 BARC supported the Mangalyaan programme by fine tuning the tracking system for the Mars Orbiter with precision servo system in 32m antenna developed earlier for Chandrayaan mission.

During this period it was possible to transfer four new technologies for societal application:-

M.1 Litchi preservation processing technology developed at BARC was transferred to an international trading company in Madagascar. An automatic fruit dip treatment machine (10 kg/h capacity) was designed and developed at BARC for processing fruits and vegetables.

M.2 The technology of NOx based wound dressing was successfully incubated and transferred to a private party in Tamilnadu. The dressing was found to be very effective in managing diabetic and chronic wounds in human trials.

M.3 Four patent approvals were received during the year. An European patent has been granted for "A Flexible Magnetic Membrane based Actuation System and Devices involving the same".

BARC scientists continue to get award in diverse fields. We may note a few of them:-

N.1 Three of our young scientists have been selected for the 2014 INSA Young Scientist Award, a first-time event*. The awardees are; Shri Mani Krishna Venkata Karri (MSD-MG) for material science; Shri Prakash Chandra Rout (NPD-PG) for Physical Science; Dr Ashish Kumar Srivastava (NABTD-BSG) for Biological Science.

N.2 BARC plant breeding team bagged the IAEA-FAO Award for their achievements in plant mutation breeding; this award was announced and given during the 2014 General Conference week of the IAEA in Vienna.

Continuous efforts are being made to improve various infrastructural facilities in various BARC campuses:-

P.1 Two units of 11 KV Sub-Stations at Trombay Hill have been renovated with the state-of-the-art equipment like, SF_6 gas filled Switch Gears and dry type Transformers, to feed power supply to facilities located at Trombay Hill.

P.2 A VFD-based ventilation system, including PLC based control, was commissioned in Beryllium Metal Plant at Vashi Complex.

* Please See Addendum on last page

P.3 Kharghar dispensary was made operational with limited staff. The facility will be fully functional after manpower is sanctioned. About 6000 beneficiaries are making use of the facility.

Dear Colleagues,

This list of achievements mentioned so far in diverse fields, is something we should be proud of. Now I would like to mention some major achievements of BARC which were possible only because of concentrated efforts by large groups.

SP-1 Propeller shaft of Arihant was rotated for the first time with nuclear steam on 11.12.13 i.e. December 11, 2013. Subsequently most harbour trials have been completed and the vessel is getting ready for sea voyage.

SP-2 Cold criticality experiment on reload core of Arihant was completed at P4 facility, and later, hot criticality and associated physics experiments, were also carried out. After completion of orificing activities, the core is now ready for shipping.

SP-3 Reprocessing facilities continued to perform very well and PREFRE-II exceeded the rated capacity in the third consecutive year

since the beginning of operations. KARP also is working well and operating near rated capacity.

SP-4 As a result of this success I am proud to announce that we have been able to produce all the pins necessary for criticality of PFBR. Beryllium blocks and delayed neutron detector pins have also been supplied. After completion of development activity, production of neutron detectors for reactor control and monitoring, is nearing completion.

SP-5 Intermediate level waste processing facility operation continues at WIP Kalpakkam and one tank of KARP has been emptied. Organic waste and resin cementation facilities have also been commissioned at Kalpakkam. I am happy to announce that high level waste processing facility (excluding vitrification) along with uranium separation plant was hot commissioned this week. Inactive commissioning of vitrification facility was completed sometime back.

SP-6 Hot commissioning of new hot cell facility at RLG has been completed. This facility, will make it possible to do the Post Irradiation Examination of larger size fuel assemblies subjected to higher burn-up.

SP-7 I am glad to announce that advanced heavy water up-gradation facility at Kalpakkam, is being operated regularly and the plant has matched its operation with MAPS reactor operation and availability of feed.

SP-8 During the General Conference at IAEA, Vienna; India participated in scientific forum on nuclear waste management. We had put up a stall exhibiting the facilities, for total solution to waste management issues, starting with spent fuel storage, reprocessing, actinide separation, vitrification, interim storage and subsequent disposal. The exhibition attracted over 400 visitors during the General Conference. The all round development in India in this field, drew appreciation, from many knowledgeable professionals.

SP-9 Extra efforts for induction of talents in our Training School resulted in 1.2 lakh applications and subsequent recruitment of 258 Trainees in various campuses of BARC Training School.

SP-10 Starting from the beginning of this year, Dhruva continued to operate at peak power of 80 MW. The effort made by the Dhruva operators and the fuel fabricators for making this happen is commendable.

SP-11 Hot commissioning of augmented Lithium Metal Plant was started yesterday.

SP-12 This week, the hot commissioning of Additional Waste Tank Farm was also started with the transfer of Alfa bearing intermediate waste from PP.

SP-13 The waiting period for patients at Radiation Medicine Centre, Parel was brought down from 6 months to zero, by some procedural changes and extra efforts on the part of their staff members. I consider this as a major success in our initiatives in healthcare sector.

We observe that not only fruits and vegetables are seasonal but scientific and technological achievements are also seasonal in our country. Every year in four months preceding the Founder's Day most major milestones are achieved in BARC.

Dear Colleagues,

In the end I must appreciate the excellent support from our colleagues in administration, accounts, health care, fire services, engineering services, security, association matters, and several other areas, that made all our progress and achievements possible.

Before concluding I wish to inform that the BARC Family Relief Scheme support to the bereaved family is being increased from Rs.1 lakh to Rs.1.3 lakh.

So far we have achieved a lot, but we have the potential for much more. We have to re-orient ourselves and concentrate on converting our R&D efforts towards the deliverables for the benefit of our nation.

Thank you.

Addendum

This is with reference to point No. N.1 at page 13 of above address note.

We are indeed very happy to be informed by Dr Vijay Kumar (Former Associate Director, Knowledge Management Group) that three BARC scientists have received INSA Young Scientist Awards in the same year not only in 2014 but also in 1977.

In 1977 Dr. Vijai Kumar, Dr. A.K. Suri and Dr. V.P. Joshi received INSA Young Scientist Awards for Physics, Material Sciences and Biological Sciences respectively. It is an interesting coincidence that the awardees in 2014 are also from the same disciplines.