

**Founder's Day Speech by Chairman, AEC**

**2015**

As we celebrate Dr. Homi Bhabha's 106<sup>th</sup> birth anniversary, I would bring out some of the major milestones achieved in the Indian nuclear programme beyond those at BARC (which I reported a short while ago) during the past year.

Nuclear Power Corporation of India Ltd. (NPCIL), responsible for operating nuclear power plants in India, generated 37,835 MUs of electricity the highest ever, in 2014-15, with a Capacity Factor of about 82% and Availability Factor of 88%. In the current year, NPCIL has generated 19118 MUs of electricity during April to September 2015.

The first unit of the Kudankulam Nuclear Power Plant, which achieved its first criticality in July 2013, started commercial operations from December 31, 2014, taking the country's installed nuclear power capacity to 5780 MWe. The second unit at Kudankulam is expected to be commissioned early next year.

Indian nuclear power plants continue to register records of long continuous runs. This year, two more continuous operation of more than a year of our NPP has been registered: Narora Atomic Power Station Unit-2 registered continuous run of more than a year and completed 518 days on September 27, 2015 (prior to planned shutdown); Kaiga Generating Station Unit-4 registered continuous run of more than a year and completed 419 days of continuous run before start of its biennial shutdown on July 28, 2015.

Following the completion of construction of the 500 MWe Prototype Fast Breeder Reactor (PFBR), its commissioning is in progress. BHAVINI has made application for regulatory clearance for the stage-wise commissioning, namely, sodium filling, fuel loading followed by criticality and raising of power.

The Fast Breeder Test Reactor (FBTR), completing three decades of successful operation this year, was operated at the highest ever power level of 24.5 MWt and 5 MWe, with the Turbo Generator synchronized to the grid.

Construction work is progressing on four indigenous 700 MW Pressurised Heavy Water Reactors, Units – 3&4 of Kakrapar Atomic Power Project (KAPP 3&4) at Kakrapar in Gujarat and Units-7&8 of Rajasthan Atomic Power Project (RAPP 7&8) at Rawatbata in Rajasthan. The civil works at these sites and erection of various components and equipment are progressing in parallel. Deliveries of key equipment to the sites have commenced.

Our Government has accorded approval for setting up of two Light Water Reactors (LWRs) in collaboration with Russian Federation (Kudankulam Nuclear Power Project Units-3&4; 2X1000 MW) at Kudankulam, Tamilnadu, and two indigenous PHWRs, Gorakhpur Haryana AnuVidyutPariyojanaUnits-1&2; 2X700 MW, at Gorakhpur, Haryana.

The State-owned General Insurance Corporation-Reinsurer (GIC-Re) and several other Indian insurance companies came together in June 2015 to launch an Indian Nuclear Insurance Pool (INIP). The INIP will initially launch the insurance product for NPCIL to cover the operator's liability under the provisions of the Civil Liability for Nuclear Damage (CLND) Act 2010. A separate product will be subsequently launched to cover the risks of the suppliers under this Act.

The performance of several Indian fuel cycle facilities continues to reach higher levels every year. The PHWR fuel production at NFC, Hyderabad achieved an increase of 30% in 2014-15 over the previous year.

Heavy Water Plants continued to deliver their best with over 100% capacity utilisation (111%), and with the lowest ever specific energy consumption. HWB's solvent production plants operated successfully to meet the requirements of nuclear solvents for front-end and back-end of nuclear fuel cycle.

AMD has established 14,463t *insitu* U<sub>3</sub>O<sub>8</sub> during the last one year, taking the total to 50,926t in XII Plan period until now and the country's uranium resources has been updated to 2,25,936t U<sub>3</sub>O<sub>8</sub> corresponding to 1,91,593t U.

Domestic production of uranium by UCIL also recorded its highest ever production till date, despite facing certain adverse situation in some places.

We have made significant strides in augmenting uranium supplies from the foreign sources also. During Hon'ble PM's visit to Canada in April 2015, an agreement was entered into for supply of 3000 tonnes of Uranium ore concentrate. Similar agreement has been entered with Kazakhstan during his visit in July 2015 for supply of 5000 tonnes of uranium over five years.

Commercial operation of 10,000 tons per annum (tpa) monazite processing plant was started by IREL in May 2015. IREL recorded maximum quantity of raw sand mining in a year, about 47 lakh tons, in its OSCOM unit.

ECIL completed installation of Radiation Detection Equipment (RDE) at major seaports. Supply of Programmable Logic Controller System for fuel loading application at Satish Dhawan Space Centre, for ISRO, Sriharikota was also completed by ECIL.

In March this year, the IAEA's Integrated Regulatory Review Services (IRRS) mission conducted the peer review of the nuclear power related regulatory activities of the Atomic Energy Regulatory Board (AERB). The IRRS team appreciated the AERB's actions and the initiatives taken as a follow-up of the Fukushima accident related reviews.

Under the aegis of our Ministry of External Affairs, DAE and NPCIL conducted a 5-week Foundation Course on Nuclear Energy (FCNE) in Mumbai for 35 professionals of Bangladesh.

In the field of fusion science, Steady State Superconducting Tokamak (SST-1), at Institute of Plasma Research (IPR), Gandhinagar, Gujarat, has become operational

with repeatable plasma discharges up to ~ 500 ms duration and plasma currents in excess of 60 kA with Toroidal Magnetic Field of 1.5 Tesla.

As part of India's participation in ITER, the ITER-India, the domestic agency, delivered its first components of in-kind contributions: a high heat flux receiving component has been delivered to the Neutral Beam Test Facility (NBTF) at Padova, Italy in December 2014 and the first batch of Neutron Shield Blocks to Korean domestic agency in June 2015. The first Lot of Cooling Water pipes have reached Cadarache site in September.

KAMINI reactor has been successfully operated for neutron radiography of pyro-devices for the space mission. The high temperature fission chambers developed by BARC for PFBR have been successfully tested in KAMINI upto a temperature of 575°C in a specially heated chamber loaded in the reactor.

The DAE's Indus-2 synchrotron radiation source at RRCAT, Indore has been operating round the clock at 2.5 GeV energy and up to 200 mA current. With the commissioning of a soft x-ray reflectivity beamline, the total number of operational beamlines on Indus-2 has increased to thirteen.

RRCAT is setting up an extensive infrastructure for fabrication, processing and testing of superconducting radio-frequency (SCRF) cavities which are essential elements for the future major projects on Accelerator Driven System and Spallation Neutron Source. One of the major milestones achieved during last year was the successful testing of an indigenously developed five-cell, 1.3 GHz SCRF niobium cavity.

Large size (2.5 m. x 1.25 m.) Bakelite Resistive Plate Chamber (RPC), an advanced type of gaseous detector for basic science research, and also with potential for cancer research, has been indigenously developed and tested at VECC.

India participated in the IAEA's Scientific Forum this year (during the week of the General Conference) on the theme 'Atoms in Industry: Radiation Technology for Development'. India has a large programme in this area, and has also been the

Lead Country in the Industry sector for the IAEA Regional Cooperation Agreement (RCA) Programme for several years. In this context, DAE did set up an exhibition at IAEA showcasing indigenous technological capabilities and contributions in the development of applications.

BRIT has been continuing to encourage private sector to establish Radiation Processing Plants for sterilisation of healthcare products and hygienisation of food and agro products for their safe and prolonged preservation. Two new plants were commissioned in 2014 one at Unnao, Lucknow and at Bavla, Ahmedabad.

A Memorandum of Understanding was signed on May 17, 2015, during the visit of the Honourable Prime Minister to Mongolia, between Tata Memorial Centre (TMC) and National Cancer Centre, Ulaanbaatar, Mongolia for gifting of the indigenous teletherapy machine, Bhabhatron, alongwith Digital Radiotherapy simulator (both developed by BARC) to National Cancer Centre at Ulaanbaatar.

As a part of continuing efforts towards the development of cost-effective and efficient tools for management of cancer, the Tata Memorial Centre (TMC), in collaboration with IAEA, has helped to develop a smart-phone App for cancer staging. The TNM App (tumour, node, metastasis) was launched during the week of IAEA General Conference in an event jointly organised by IAEA and Indian Embassy in Vienna.

Under the auspices of the Global Centre for Nuclear Energy Partnership (GCNEP) initiative, five off-campus training courses were conducted. They include IAEA Course on Reactor Safety, Nuclear Material Security, Physical Protection etc.

DAE has paid special attention to enhancing public outreach and awareness programmes throughout the year. As a part of DAE celebrating its Diamond Jubilee year (launched in August 2014), a large number of events were held by the various Units of DAE at different locations in their campuses and other places. DAE's participation in the 2015 Republic Day parade with a Tableau was a major highlight, apart from DD advertisements including in regional languages. DAE has recently

made an entry in the social media also, with its launch on Facebook on 16 October 2015.

HBNI, a deemed-to-be-University (since June 3, 2005), completed ten years of existence this year. HBNI has received NAAC Accreditation as "A Grade" University on May 11, 2015.

In spite of all these achievements in diverse fields, we need to do much more. Nuclear programme needs to be accelerated both in the area of nuclear energy and nuclear applications. KKNPP-2 and PFBR must be commissioned early and nuclear recycle plants at Kalpakkam must be operational earlier. Production of Uranium needs to be increased and for that we need to look at all possibilities. Similar acceleration is required in the area of healthcare and the management of waste to support Swachh Bharat Mission.

I am sure all my colleagues in 29 institutions of DAE will do everything possible to accelerate our programmes and take our department to a higher platform and fulfill Dr. Bhabha's dreams.

Thank you and Jai Hind.