Founder's Day – 2012

(Tuesday, October 30, 2012)

Address by

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Chairman, Atomic Energy Commission &

Secretary to Government of India, Department of Atomic Energy

Distinguished seniors, invitees and dear colleagues,

Today we have assembled here to pay homage to our founder Dr. Homi Jehangir Bhabha on the occasion of his 103rd birth anniversary. We celebrate this day as Founder's day and on this occasion take stock of our recent performance, recalibrate our actions vis-à-vis our road map and rededicate ourselves to realise the vision of our Founder.

Dr. Bhabha created a blueprint for the Indian Atomic Energy Programme and laid a solid foundation on which successive generations of members of the DAE family have built the superstructures that have played an important role in national development.

The programmes pursued by our Department cover almost all the scientific and engineering disciplines. The specific activities addressing Research, Development, Demonstration and Deployment have given us the strength to provide a vast range of key deliverables in all aspects of use of

nuclear energy. These programmes have helped the development and growth of our industries and also several research and academic institutions to cater not only to the needs of our Department, but also to the requirements of the country at large.

The Department continues the pursuit of three-stage nuclear power programme, formulated under the visionary leadership of Dr. Homi Jehangir Bhabha. This programme underlines our strategy of adopting a closed nuclear fuel cycle to extract the maximum energy from the limited uranium resources, to ensure sustainable nuclear waste management and, above all, to achieve long-term energy security through utilisation of thorium. With the rising cost of imported fossil fuel resources and the mounting environmental concerns being raised the world over, nuclear energy has an important role to play in the energy security of our country.

Nuclear power generation in our country continues to grow due to the improvement in supply of uranium from domestic as well as international sources, and in 2011-12, it has registered an increase of about 23% over that generated in 2010-11. The average annual availability of the reactors has also increased from 83% to 91%, while the average annual capacity factor has increased from 71% to 79% during the same period.

In March 2012, the 540 MW, indigenously built Tarapur Atomic Power Station unit-3 (TAPS-3), achieved a period of uninterrupted operation lasting

522 days. With this, till date, ten of our reactors have had continuous runs of over a year, with three of them registering over 500 days of continuous run, the longest being 590 days. This demonstrates the maturity of our indigenous technology.

In all, today, Nuclear Power Corporation of India Ltd. (NPCIL) is operating twenty nuclear power reactors at six different sites, with unblemished safety record. It is currently constructing six new nuclear power reactors at three different sites, while BHAVINI is engaged in construction of Prototype Fast Breeder Reactor at Kalpakkam. Construction of four indigenously designed 700 MW PHWRs, two each at existing sites of Kakrapar in Gujarat and Rawatbhata in Rajasthan, is on schedule and these will be completed by the year 2017. The construction of the 500 MW Prototype Fast Breeder Reactor (PFBR) is progressing well at Kalpakkam. The construction and installation activities in the Reactor Vault are nearly complete, with all the major reactor equipment in place.

All this demonstrates our readiness to undertake larger capacity expansion in the field of nuclear power generation and hence in the XII Plan we have proposed to launch eight PHWR reactors of 700 MW capacity each at four different sites viz Gorakhpur Units -1&2 in Haryana, Chutka Units -1&2 in MP, Mahi Banswara Units - 1&2 in Rajasthan and Kaiga Units - 5&6. It is also proposed to initiate activities towards the launch of two units of Fast Breeder Reactors (FBR-1&2), and Advanced Heavy Water Reactor (AHWR),

which would be a technology demonstration plant, for the third stage of our nuclear power programme, with advanced safety features.

It is a matter of great satisfaction that the world today recognises India as a country with advanced nuclear technology and is coming forward to collaborate in our nuclear power programme.

The work on the construction of the first of the two 1000 MW Light Water Reactors (LWRs) at Kudankulam is complete. The operation of unit-1 is expected to commence shortly and the commissioning of the second unit is expected to follow early next year.

Light Water Reactors (LWRs), with international cooperation, each of capacity 1000 MW or more at another four different sites viz Kudankulam in Tamil Nadu (KK-3&4); Jaitapur in Maharashtra (JNPP-1&2); Kovvada Unit-1&2 in Andhra Pradesh; and Mithi Virdi Unit-1&2 in Gujarat are also planned.

In the areas of Uranium exploration, the Department has enhanced its activities. Due to the efforts of Atomic Minerals Directorate for Exploration and Research (AMD), we have been able to identify new resources of Uranium, and in the last five years, our identified reserves have registered a steep increase of about 70%. The Tummalapalle deposit holds the promise to be the biggest deposit of uranium in the country. As of now about 72,000 tons of

uranium deposit has been identified at the site. AMD has used the technology of Time Domain Electro Magnetic system for finding deep seated newer uranium reserves. Indigenous development of airborne geophysical exploration equipment using this technology has progressed well, both at BARC and IGCAR.

Uranium Corporation of India Ltd (UCIL) has been successfully operating mines and mills at Jaduguda region and has constructed Tummalapalle Mine and Mill in a record time of five years. With the commissioning of the Tummalapalle mill, there would be substantial improvement in the supply of indigenous uranium, which will further increase the capacity factors of our nuclear power reactors operating on indigenous uranium.

The Indian Rare Earths Limited (IREL) is setting up a 10,000 ton per annum Monazite processing plant at Odisha Sands Complex, Chatrapur, Odisha (OSCOM). The plant is expected to be commissioned by December 2012. A part of the mixed rare earths chloride produced in the Plant will be processed by IREL's Rare Earths Division, Aluva, Kerala, by using the existing facilities there for producing separated high purity rare earth oxides.

In the year 2011-12, Nuclear Fuel Complex (NFC) has recorded a production of 751 tons natural uranium based fuel for our Pressurised Heavy Water Reactors (PHWRs), which is an increase of about 15% over the production in the previous year. NFC has also achieved the highest ever production from most of its plants. NFC has successfully developed Inconel-

617 seamless tubes in a record time for a national project, initiated by the Government of India, to establish the technology for Advanced Ultra Supercritical Boilers in Thermal Power Plants, aimed at achieving a thermodynamic efficiency of 47%, with a consequent reduction of 26% in carbon- di-oxide (CO_2) emissions. NFC is now gearing up to set up new plants to fulfil the needs of the fuel and zirconium alloy components for the expanding nuclear power programme.

As you are aware, we have successfully closed the nuclear fuel cycle for our PHWR programme. Director BARC has just now stated that the new reprocessing plant (PREFRE-2), has completed the first year of its operation with outstanding performance. The adjoining facility of our second advanced vitrification system (AVS-2) at Tarapur started functioning from 31st August 2012 and has been giving excellent performance in the vitrification of high level nuclear waste. In this context, I will like to add that the successful decommissioning of the first advanced vitrification facility (AVS-1) has further underlined our technological strength to undertake complex nuclear decommissioning tasks, after the successful en-masse coolant channel removal programme implemented at six of our PHWRs.

At our Indira Gandhi Centre for Atomic Research (IGCAR), the Fast Breeder Test Reactor (FBTR) has continued to operate smoothly, providing valuable operating experience as well as technical inputs to India's fast reactor programme. Post-irradiation examination of the test fuel subassembly for the Prototype Fast Breeder Reactor (PFBR), which was irradiated in FBTR

to reach a peak burn-up of 112 GWd/t, has provided valuable data and generated confidence in the design and manufacture of the FBR fuel.

Performance of all the operating Heavy Water Plants has continued to be excellent and the Heavy Water Board has achieved more than 100% capacity utilisation. HWB has executed three export orders of 27 tons. In addition, two orders of 16 tons are in pipeline.

In the field of other in-core materials, HWB has successfully delivered the entire quantity of enriched boron for the first core of PFBR. In respect of solvent for nuclear fuel cycle, both the newly installed industrial facilities at HWP Baroda and Talcher have performed very well.

Indus-2 synchrotron radiation source at Raja Ramanna Centre for Advanced Technology, Indore, reached a major milestone of operation at design energy of 2.5 GeV and 100 mA current on December 6, 2011. This has increased the radiation flux available from Indus-2 by a factor of 20 to 30 at X-ray energies above 10 keV. It is really praiseworthy that this has been accomplished with the support of in-house developed new technology of Solid State RF Amplifiers to replace two non-functional klystrons, for which no replacements were available from abroad. I am happy to say that very recently the protein crystallography beam line of Indus-2 has become operational. Indus-1 and Indus-2, with their 5 and 8 beamlines operational respectively, are working round-the-clock and serving a large community of users in the country. This may be evident from the fact that since January 2011, the total number of Indus users have gone up to 164 and the number of papers published in international journals using Indus to 72.

RRCAT has also made remarkable accomplishments of building single-cell 1.3 GHz superconducting RF cavities which have provided accelerating gradient and quality factor comparable to international standards. Next, as you would be aware that RRCAT is making notable contributions in the area of lasers, particularly in bio-medical, laser-plasma interaction and industrial applications. I would like to mention about their first ever development of new technique of laser welding of superconducting niobium cavity, for which an international patent has been applied for.

The K-130 Room Temperature Cyclotron at Variable Energy Cyclotron Centre (VECC), Kolkata has been operating extremely well and delivering beams, which are being used for various experiments on nuclear physics, nuclear chemistry and radio isotope production. It has been used recently to produce and accelerate the first radioactive ion beam of Oxygen-14 and Potassium-40. The superconducting cyclotron, under commissioning at VECC, is expected to deliver external beam soon.

The Board of Radiation and Isotope Technology (BRIT), apart from operating two Radiation processing plants, has helped in design, construction and operation of nine radiation processing plants in the private sector. Six such plants are under construction and MoUs have been signed with another eight private entrepreneurs. These plants are processing disposable medical items, spices, pet feed and ayurvedic & herbal products. They are contributing towards food preservation and hygenisation programme of our country.

In the area of health care, the first Medical Cyclotron Facility (MCF) of India, set up in BARC for production of tracers for positron emission tomography (PET), has completed ten years of successful operation this month. It is heartening to report the considerable parallel growth of similar facilities in India, including those in private medical institutions. Currently, there are 16 medical cyclotrons and 70 PET-CT units in India, providing nuclear medicine services to patients.

Recently, two major experiments at the Large Hadron Collider (LHC) at CERN, ATLAS (A Toroidal LHC Apparatus) and CMS (Compact Muon Solenoid), have announced the observation of a new resonance which is likely to be the Higgs Boson. This state has been searched extensively for almost 50 years since its prediction and the discovery fulfils the primary physics motivation for the existence of the LHC project. DAE is proud to be a part of this quest, in which its institutions have been involved for a long time with participation in efforts related to the LHC machine, the detectors, the experiments, as well as Grid computing.

In high energy physics, strong international collaborations involving TIFR scientists culminated in the installation of the outer hadron calorimeter at the Large Hadron Collider (LHC) in CERN, Geneva. Fabrication of Resistive Plate Chambers (RPCs), an essential part of the detectors for the India-based Neutrino Observatory, has begun.

As you may be aware, very recently Dr. Ashoke Sen of Harishchandra Research Institute has received the prestigious Fundamental Physics Prize awarded by the Fundamental Physics Prize Foundation founded by the Russian physicist and entrepreneur Yuri Milner, for his work on string theory. We, in the DAE family are very proud in this achievement of one of our family members.

Human resource development is another area where we have immensely benefited from the foresight of Dr. Bhabha. However, the challenges posed by the major expansion that we foresee in our programme, new technological areas that we need to work on and the external attractions necessitate new initiatives. Homi Bhabha National Institute (HBNI) continues to register large number of our scientists and engineers for the PhD programme.

I am glad to inform that very recently a task force set by Ministry of Human Resource Development (MHRD) has placed Homi Bhabha National Institute (HBNI) in category 'A' and the MHRD has accepted the report. Pursuit of academic excellence through a rigorous programme of study and research should be central to functioning of HBNI and it is possible to do so if every faculty member imbibes excellence and rigour in day to day working. I take this opportunity to request all of you that academic excellence and rigor has to be observed at all levels; admissions, class room teaching, evaluation of students performance in examinations, research, publications including

theses and evaluation of research. We also have to continue to follow all UGC guidelines as applicable.

Our Homi Bhabha Centre for Science Education (HBCSE) has been training students to participate in various Science Olympiads. Six-member Indian team secured 2 Gold and 3 Silver medals and 1 Hon'ble mention at the 53rd International Mathematical Olympiad held at Mar del Plata, Argentina from July 4-16, 2012.

Dear Colleagues,

I have just highlighted some of the major achievements that have been accomplished by the Department during the last year. While our achievements have been impressive, let me share with you some international experiences. The Global response to the Fukushima accident of March 2011 at Japan, by and large, has been very mature. While committing to learn complete lessons from the accident to enhance safety, the growth prospect of nuclear power continues to be driven by the concerns of energy security to meet long term developmental goals. This is aptly demonstrated when we note that post-Fukushima, seven newly constructed reactors in five different countries have been connected to the grid, and that many newcomer countries have decided to continue with their policy for launch of nuclear power programme. Furthermore, many countries, including India have continued with their programme for expansion of nuclear power, while simultaneously placing additional emphasis on nuclear safety. It is, thus,

pertinent to note the latest IAEA projections, which show a continued growth for nuclear power in the world, in the coming decades.

Notwithstanding these indications, the Fukushima accident underscored the urgency for satisfactorily and sustainably addressing the issue of public perception of relative benefits, vis-a-vis the risks of nuclear energy.

In the recent past, the different units of the Department of Atomic Energy have vastly enhanced their public outreach activities with visible results. We are also planning to hold a series of media workshops and translate most of our public information related material into regional languages. This will also help in dispelling the myths concerning the harmful effects of radiation arising out of operation of our facilities through due dissemination, in a simple language, of the facts based on the studies on related issues already carried out in the country, not only by us, but also by other research and academic institutions.

Another activity in this direction is to clearly identify the very high margins of conservatism inherent in the existing radiation protection philosophy. In this direction, we have already initiated a science based programme to consolidate the already available scientific findings and identifying new areas of research to address the thresholds, below which no harmful effects of radiation do take place in human beings. We are

seeking international collaborations in such research activities.

Dear colleagues, in our history of more than five decades we have overcome numerous challenges coming in the path of growth of our programme. Each such challenge has given us a greater resolve and determination to work even harder to overcome the hurdles. I am quite sure that with the contributions from every member of the DAE family and our collaborators, we will carry forward our programme with continued enthusiasm and vigour in the years to come. Let us remember that each milestone reached in our march to further progress is, in fact, our tribute to our founder Dr. Homi Jehangir Bhabha and the other pioneers of our department.

Thank you,

Jai Hind.