Founder's Day - 2010
Address by
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Dear Colleagues,

I extend my warm greetings and compliments to all of you on the occasion of the 101st birth anniversary of our beloved founder Dr. Homi Jehangir Bhabha. As is customary on this day, we take stock of the year gone by and rededicate ourselves for the cause of strengthening the Nation through various facets of our activities. The last year witnessed landmark achievements, impressive growth in programmes, and major initiatives, covering a wide spectrum. I intend to present a brief account of some of these achievements in the next few minutes.

Since we met last year, construction of two new nuclear power reactors viz. Rajasthan Atomic Power Project – Unit 5&6 was completed and they commenced commercial operation. With this the total number of nuclear power reactors in operation in the country has become 19 with total installed capacity of 4560 MWe. The Unit 2 of RAPS was resynchronised with the grid after completing its enmasse feeders replacement. Enmasse coolant channel replacement (EMCCR) and upgradation of Unit 2 of Narora Atomic Power Station was completed and it was resynchronised to the grid last month. The upgradation including EMCCR and EMFR of Unit 1 of Kakrapar Atomic Power Station is nearly complete.

Kaiga Unit 4 is expected to become operational within next two months. Two light water reactors of 1000 MWe each being built in technical cooperation with the Russian Federation at Kudankulam are advancing towards completion.

The project works on Kakarapar Atomic Power Project-3&4 and Rajasthan Atomic Power Project-7&8 have been started. These four indigenously designed PHWRs are of 700 MWe each. Pre-project activities on Kudankulam Nuclear Power Project - 3&4 have been initiated. In respect of Jaitapur Nuclear Power Project -1&2, the physical possession of land is in progress.

The Nuclear Power Corporation of India Ltd. has signed MoUs with NTPC Ltd., Indian Oil Corporation Ltd., National Aluminium Corporation Ltd., Korea Electric Power Corporation etc. to work together for setting up nuclear power plants in India. It also signed an MoU with M/s Larsen & Toubro to incorporate a Joint Venture Company to set up an integrated facility at Hazira for the manufacture of special exotic steels and large size forgings. Under an MoU between NPCIL and Tehri Hydro-electric Power Corporation for setting up a 600 MW hydroelectric plant at Malshej Ghat, Detailed Project Report has been submitted.

In the field of uranium exploration, about 15,000 tonnes of additional uranium resources have been established in Andhra Pradesh, Rajasthan and Meghalaya. The country's uranium resources have been updated to a little more than 1,40,000 tonnes of U3O8. Promising uranium anomalies have been located in the North Delhi Fold Belt and Lachhri in Rajasthan; Tertiary basin in Uttarakhand; Mahakoshal meta sediments in Madhya Pradesh and IOG Basin in Orissa.

Mohuldih Uranium Mining Project in the Saraikela-Kharsawan district of Jharkhand and Tummalapalle Uranium Mining & Milling Project in Andhra Pradesh and Exploratory Mining at Gogi in Karnataka are advancing. Pre-project activities for Uranium ore mining and milling projects at Lambapur in Andhra Pradesh and Kylleng Pyndengsohiong, Mawthabah (KPM) in Meghalaya are on.

Highest ever production of PHWR fuel bundles, Zirconium sponge, PHWR fuel tubes, rod material & Niobium metal was achieved at the Nuclear Fuel Complex, Hyderabad. The Zirconium Complex at Pazhayakayal, Tamil Nadu has started production of Zirconium Oxide. NFC successfully executed an order received from IAEA against global competition for manufacture, supply, erection and commissioning of fuel element end-cap welding unit to Turkish Atomic Energy Authority.

Hardly three weeks back, the Fast Breeder Test Reactor and the Radio-metallurgy Labs of IGCAR celebrated their Silver Jubilee. On the occasion, the spectacular performance of the novel mixed carbide fuel with a burn-up of about 165 MWD/T received applause from international experts. The 500 MWe PFBR being constructed at Kalpakkam has achieved about 60 % physical progress. The PFBR test sub-assembly has logged a burn-up of close to 110, 000 MWD/T in the FBTR against the designed burn-up of 100,000 MWD/T.

SADHANA- a Sodium loop for testing of PFBR Safety Grade Decay Heat Removal in sodium was commissioned and experiments have qualified the component and system design. An IAEA international collaborative project, with participation of India, China, European Commission, Republic of Korea and Russia, has been initiated at IGCAR. As part of this project, study of decay heat removal system has been carried out and the results provide significant inputs for design of future FBRs.

Country's first two industrial scale production facilities for enriched boron, required for the fast breeder reactors, were commissioned at Talcher and Manuguru. These are based on exchange distillation and ion exchange chromatography respectively. A plant for converting the enriched KBF4 into elemental Boron based on the process of electrolysis was also set up at HWP, Manuguru. The capacity utilization of heavy water plants, during the year exceeded

100%. Heavy Water Board bagged the sixteenth export order for supply of 11 MT heavy water to M/s KHNP, South Korea.

At the Compact Reprocessing facility for Advanced Fuels in Lead cells (CORAL), Kalpakkam, the spent fuel subassembly from FBTR with a burnup of 155 GWd/t was reprocessed and the fissile material was re-fabricated as fuel and loaded back into the reactor. This marked the successful closing of the fast reactor fuel cycle.

This year in April, an old Gamma Cell imported by Delhi University about four decades back from Canada, unfortunately landed in a scrap market in Delhi resulting in radiation exposure of a few persons. At the time of this emergency, a large number of our colleagues from BARC, Narora Atomic Power Station, AMD Northern Region and AERB worked relentlessly for recovery and safe disposal of the radioactive material and decontamination of the whole area. I offer my compliments to all of them.

DAE has signed the Third Tripartite Agreement with the North-Eastern Council and the Government of Assam, for the revitalization of the Dr. B. Barooah Cancer Institute, Guwahati. This hospital is a Regional Cancer Centre (RCC) for cancer treatment and control in the North-Eastern Region.

A Bhabhatron teletherapy machine for cancer therapy was donated to Vietnam as per an agreement between International Atomic Energy Agency, Republic of India and Socialist Republic of Vietnam. The machine was inaugurated at Can Tho Oncology Hospital in Vietnam on April 28, 2010. Two more such units are being donated – one to Sri Lanka and the other to an African country. At BRIT, a user-friendly IRMA kit for Luteinizing hormone (LH) based on in-house produced magnetizable cellulose particles was developed.

A parallel high-performance supercomputing cluster has been commissioned by IGCAR to cater to the large-scale numerical

computational requirements of users in the areas of computational molecular dynamics, material modelling, reactor core calculations & safety analysis, weather modelling and computer aided engineering applications. An advanced visualization centre, a world-class fully immersive system has also been commissioned at IGCAR to visualize the models of fast breeder reactors and associated fuel cycle facilities.

Recently for two weeks during this month, the whole world saw the spectacular Common Wealth Games held at New Delhi. I am particularly glad to share with you that DAE had its own share in the success of this event. ECIL supplied equipments worth over Rs. 230 Crores for the games. A large number of personnel from various security agencies in the country were trained on detection of any radiation sources and mitigation of any radiation emergency. In addition, during the games, a team of radiation scientists was deputed at the venue for radiation surveillance.

An all solid state bouncer compensated modulator developed at RRCAT for a CERN experiment achieved rated specifications and was accepted by the CERN team. RRCAT fabricated two prototype 1.3 GHz single cell superconducting cavities in collaboration with the Inter University Accelerator Centre (IUAC), New Delhi and they were tested at Fermi Lab, USA for 22 MeV/m gradiant.

During the year India has entered into bilateral agreements and MoUs with many countries for cooperation in peaceful uses of atomic energy. Some of these countries are Namibia, Mongolia, the Russian Federation and Canada etc. It also had a joint declaration with the United Kingdom on Civil Nuclear Cooperation. India also signed an agreement with the European Atomic Energy Community for cooperation in the field of Fusion Energy Research.

I have just highlighted some of the major achievements that have been accomplished by the Department during the last year. We

are infact going through a period of very rapid growth of our programme. At this turning point, let me paint a scenario for our future, at the end of next decade :

- **Today we are having an installed nuclear power production capacity at a level of about 4500 MWe. In 2020, we hope to reach a level exceeding 30000 Mwe.**
- **Today nuclear power generation in the country is primarily through PHWRs. After a decade we will be operating PHWRs to a capacity of about 10000 MWe. In addition we will have Light Water Reactors of different kinds, VVERs, EPRs, BWRs and AP-1000. Fast Breeder Reactors, atleast three of them, Advanced Heavy Water Reactors, both plutonium and low enriched uranium driven. Construction of Light Water Reactors of Indian design will also begin.**
- **Captive nuclear power stations will serve Indian Railways and an experimental High Temperature Reactor will demonstrate generation of hydrogen by nuclear energy, thus establishing the role of nuclear energy in Transport Sector.**
- **Indian industry will be in a position to supply all major systems and equipment including nuclear pressure vessels, large sized turbo generators not only to meet the domestic needs but also for making India a hub for nuclear suppliers for global requirements.**
- **Uranium mines and mills will operate in several parts of the country. On top of it, we will have uranium assets abroad from where unhindered flow of uranium will be assured for our nuclear programme.**
- **The enrichment capacity in the country will be enhanced to a level that a substantial quantity of enriched fuel requirement will be met indigenously.**

- **We will be operating large scale integrated reprocessing plants, 2 or 3 of them each handling over 500 tons of heavy metal.**
- **Our strategic programme will be further strengthened to assure minimum credible detterents – our triad of the delivery system will be fully functional. Electromagnetic and high power microwave devices will be deployed in our missile defence system.**
- **In the area of accelerators, a 2.5 Gev synchrotron Indus-II, other advanced light source including free electron laser, superconducting cyclotrons, Radioactive Ion Beam Facilities, medical cyclotrons, pelletron boosted by a super conducting LINAC, Spallation Neutron source and high energy electron accelerators will be operational at their optimum level to provide a wide variety of experimental facilities to not only high energy physicists but also to material scientists, chemists, biologists and engineers.**
- **India based Nutrineu Observatory (INO) will be providing scientists world over facilities for advanced research.**
- **Our association with the international scientific community will be further strengthened. We will be actively participating in experiments in CERN, ILL, GANIL synchrotron beam lines elsewhere, Jules Horowitz reactor. We will be in the final stages of commissioning ITER facilities.**
- **Several hundred Bhabhatrons alongwith several tens of electron accelerators will provide radiation oncology services to our country. The national cancer grid will integrate the facilities available all over the country.**
- **Indian farmers will get a variety of radiation mutated seeds for widescale applications. The scope will expand beyond oil seeds and pulses to many other foodgrains. Gamma and electron irradiation will be deployed on a large scale**

for food preservation. Several Electron irradiators will be attached to silos meant for hygienic food storage.

- **All the entry and exit points to the country – land, sea and air – will be equipped with scanners of different kinds to provide security against any unauthorised movement of nuclear materials.**
- **Several nuclear desalination plants will become operational.**
- **Our research centres will be offering most challenging research opportunities to fresh talents in the country who do not have to look for opportunities elsewhere. We will be successful in breaking the barriers between the disciplines and promoting research in several interface areas. We are building up a large human resource not only for our own departmental activities, but also for advanced science and technology in the country as a whole.**
- **The new centres such as BARC Vizag Campus, TIFR Hyderabad campus and its other centres such as International Centre for Theoretical Studies and National Centre for Biological Sciences in Bangalore will play a major role in bringing India in a leadership role in scientific research.**

All that I have mentioned are indeed possible in the timeframe that I have indicated. When Homi Bhabha thought of a completely indigenous atomic energy programme in the backdrop of a new-born nation with limited infrastructure, striving for survival, it was a dream. In the last six decades most of his dreams have been realised, that too when we operated essentially in complete isolation. Today, when we think of our future, we cannot call them as dreams because they are definitely realisable. We should consider them to be our targets. To achieve these targets, not only we have to work very hard, but also we have to harmonise our activities to bring synergy. In each of the areas I mentioned earlier, we have made substantial advances and I

do not see any reason why by concerted efforts of all of us we will not be able to achieve them. In a lighter vein I can say that we have played in the mid field quite well. A time has come when we should score goals and I call upon all my colleagues to have the determination and the zeal to take up the work which will touch the lives of all our countrymen. The whole world as well as our own countrymen are looking at us with great expectations. Let us try our best to fulfill the aspirations of our countrymen and in the process show the world that Indian scientists and technologists can indeed change the life of millions and bring about a transition of a country from developing state to a major power. This will indeed be the most fitting tribute to our founder Homi Bhabha.

Jai Hind.
