Independence Day

Thursday, August 15, 2024

Venue: **DAE Secretariat**

Address by

Dr A K Mohanty

Chairman, AEC and Secretary, DAE

Dear Colleagues,

A very warm welcome to all of you and a very good morning. As we celebrate the 78th Independence Day of our great nation, I pay my homage to all those glorious men and women and many more unsung heroes who have sacrificed their lives to free us from the shackles and bondages of foreign rule. On this occasion, I would also like to salute the fellow citizens of independent India who have worked tirelessly towards nation building and still continue to do so. As you all know, DAE is also part of this nation building mission since its inception 70 years back and I wish to congratulate each of you present here today for your contribution towards that endeavour in various roles and capacities.

Three years back on this very day, Hon'ble Prime Minister had shared the vision of 'Amrit Kaal' – the golden period till 2047 by when our motherland aims to establish herself as a developed nation or ***Viksit Bharat***. You are aware that in this year's regular budget, energy transition and energy security have been highlighted as one of the *Priority Areas* and it has been announced that *"Nuclear Energy is expected to form a very significant part of the energy mix for Viksit Bharat".* The government has also talked about developing a *Taxonomy for Climate Finance* to support the country's climate commitment and green transition. This acknowledges the urgency and intent of our

government and undoubtedly, nuclear energy being a very clean source of energy, will play an important role in achieving these objectives.

With this renewed sense of urgency and purpose, it is now time for us to consolidate our wide-ranging nation-centric activities and reorganise them into more focused & action-oriented mandates. Towards this, our department has released a vision document for 2047 which will contribute to the national vision of Viksit Bharat.

As you are already aware, DAE has entered the 70th year of its formation on 3rd August this year. To commemorate this occasion, we aim to announce at least 70 achievements or milestones throughout this year which will showcase our resolve to contribute to our nation's vision for Amrit Kaal. Hence, it's now time to step up our efforts and collectively deliver beyond our currently mandated activities. I am very confident that we will stand up to this challenge and fulfil the responsibility entrusted to us.

With this high hope, **Dear Colleagues,**

I would now like to share with you a list of our note-worthy achievements in the past one year.

A. ***I will start with the progress in our Nuclear Power Programme, in which AMDER, UCIL, NFC, HWB, ECIL, NPCIL, BHAVINI, BARC and IGCAR have played a major role. I will highlight a few achievements which can be seen as a major milestone in our journey for self-reliance in nuclear power.***

1. AMD has continued its sustained efforts towards augmentation of Uranium, Thorium and Rare Earths deposits. As on date, the total identified Uranium resources (U_3O_8) in the country stand at Four Lakhs

Twenty-Three Thousand tonnes – an addition of 18,600 tonnes in last one year. The country's total Beach Sand Mineral resources stand at 1,309 million Metric Tonnes.

2. During the FY 2023-24, UCIL has achieved the highest ever Uranium Ore Concentrate production.
3. Several major projects of national importance in the nuclear energy sector have been accomplished and dedicated to the nation in the last one year.
   a. First two units of the indigenous 700 MWe PHWR at Kakrapar, Gujarat (KAPS – 3 & 4) have started commercial operation. Both the units were dedicated to the nation by Hon'ble Prime Minister in the month of February this year.
   b. The Demonstration Fast Reactor Fuel Reprocessing Plant (DFRP), a unique facility in the world capable of processing both Carbide fuel of FBTR and Oxide fuel of PFBR on an industrial scale, was dedicated to the nation by Hon'ble Prime Minister in January this year.
4. India's first Prototype Fast Breeder Reactor (PFBR 500 MWe) is undergoing integrated commissioning trials and the core loading was initiated in the august presence of Hon'ble Prime Minister in March 2024. Recently, the project has received clearance from AERB for First-Approach-to-Criticality including loading of fuel in the reactor core and conduct of low-pressure physics experiments.
5. Rawatbhata Atomic Power Project (RAPP) Unit 7 – the 3rd indigenous 700 MWe PHWR in a series of 16 sanctioned reactors, has completed initial fuel loading, paving the way for achieving First Criticality of the unit.
6. Towards Long-Term Operation of the existing operating fleet of reactors, RAPS 3 - a 220 MWe PHWR which started its commercial operation in June 2000 has been restarted in less than 2 years after En-masse Coolant Channel Replacement and En-masse Feeder Replacement.

These activities were undertaken to provide enhanced safety and extend the life of the reactor by about 30 years. This is a remarkable achievement in our reactor fleet management.

7. NPCIL has achieved highest ever annual generation of 48823 MUs and highest CAPEX of ₹ 17,760 Crores in the last financial year. During the last financial year, 4 of our reactors have achieved the distinction of continuous operation for more than one year.
8. Towards operational excellence, the two operating units of VVER-1000 reactors at Kudankulam have cumulatively achieved an electricity generation of 100 billion units of clean power till now.
9. For the first time, NFC Hyderabad has successfully manufactured Cobalt Adjustor Rod assemblies for 700 MWe PHWRs.
10. Among the other notable achievements related to the 2nd stage of our nuclear power programme, the following deserve a mention:
    a. Our Fast Breeder Test Reactor, the FBTR at IGCAR continues to generate electricity in campaign mode and has generated 21.5 MUs and 13.39 MUs, respectively in 2023 & 2024 (till date).
    b. At IGCAR, the CoRAL facility has been re-licenced by AERB until 2028, and it continues to operate as the only facility in the world reprocessing high burn-up carbide fuel.
    c. IGCAR has developed an Automated Vehicle for the Pre-Service Inspection & In-Service Inspection of dissimilar Welds in PFBR.
    d. HWB is in advanced stage of commissioning of first-of-its-kind prototype closed cell for production of Sodium which is required for Sodium cooled Fast Breeder Reactors.

11. At NFC, Kota, the performance demonstration of assembly plant, grinding section of Pellet Plant and Module-2 at the PHWR Fuel Fabrication Facility has been successfully achieved.

B. ***In the area of Health Care, DAE contributes to affordable Cancer Care and indigenous development, commercialization & supply of Radio-pharmaceuticals. In this mission, TMC, BRIT, VECC, BARC and IGCAR have played a crucial role.***

1. TMC has organised 2746 camps under which 3,10,234 women were screened and 8416 cases have been diagnosed positive. This has covered a population of 80 Lakhs. The screening has helped in early detection and timely treatment of women before they develop cancers resulting in reducing the mortality
2. Chimeric Antigen Receptor (T-Cell) Therapy is a cutting-edge therapy used for the treatment of patients with certain types of acute leukemia. An indigenous CAR-T cell therapy has been developed at TMC/ ACTREC in collaboration with IIT Bombay and was dedicated to the nation by honourable President of India on 04.04.2024
3. Researchers at TMC have developed a low dose immunotherapy regimen which improves outcomes and quality of life. This has brought the cost of treatment down from Rs. 60 to 70 Lacs per year to below 5 lakhs per year.
4. In a breakthrough towards enhancing the quality of life for cancer patients undergoing radiotherapy, scientists from DAE and M/s. IDRS Labs Pvt Ltd, Bangalore have joined hands to develop AKTOCYTE tablets which aim to minimise the side effects of radiotherapy. The AKTOCYTE tablets have shown remarkable results, particularly in pelvic cancer patients suffering from radiotherapy-induced side effects.
5. The Radiation Medicine Research Centre (RMRC) at Kolkata became operational for patient services on 03rd January'24 to provide low-cost

nuclear medicine services to patients of Eastern & North Eastern States of India.

Towards the indigenization, commercialization and supply of radio-pharmaceuticals,

6. BRIT has successfully produced nearly 50 mCi of ^{68}Ga via proton irradiation of enriched ^{68}Zn nitrate with an indigenously developed liquid target system in its 16.5 MeV Medical Cyclotron Facility.
7. For the first time in India, VECC in collaboration with BRIT, has produced the SPECT radioisotope Lead-203 (Pb-203) for imaging and cancer therapeutic applications on a trial basis using a low cost natural thallium target in the 30MeV Cyclotron Facility at VECC.
8. The commencement of pilot scale production of radio isotopes (Y-90 & P-32) for the benefits of society has been started at IGCAR.

C. ***DAE continues to pursue cutting edge research, development and application in the area of advanced technologies, materials, radiation-based technologies, etc. Wide-ranging activities are being undertaken by several DAE units, including high-end accelerators, laser, plasma, space applications and radiation technologies for food security, water management, waste treatment and even e-governance.***

1. NFC has supplied indigenously developed Titanium half alloy Seamless Tubes to Vikram Sarabhai Space Centre for the Gaganyaan Project.
2. NFC has successfully developed Hastelloy (a Ni based alloy) Tubes for Indian Molten Salt Breeder Reactor test loop. NFC has also indigenously developed of high RRR Niobium as an import substitute for SCRF cavities which are crucial for our ADSS and ISNS programs.

3. The foundation stone for "RAUDRA," a Plasma pyrolysis-based Bio-medical waste disposal plant developed by IPR was laid by Hon'ble PM in Varanasi on 23rd February 2024. This technology utilizes high-temperature plasma torches in an oxygen-starved environment for efficient and eco-friendly disposal of bio-medical waste. The facility will handle bio-medical waste from various hospitals and healthcare units in Varanasi.
4. Over the past few decades, IPR has made major contributions in the field of pure electron plasmas confined inside a magnetic "cage" in a toroidal geometry. Recently, the SMARTEX-C experiment in IPR has reported the highest confinement time of pure electron plasma ever reported in the world, viz., exceeding 100 seconds, more than 10 times that reported in other countries.
5. IPR has developed a 232 mm long liquid nitrogen cooled High temperature Superconducting magnet using Rare-earth barium copper oxide (ReBCO) tapes. The applications include medical, materials science, magnetic fusion, particle accelerators, quantum computing, superconducting magnetic energy storage, transformers, industrial motors & generators.
6. As a part of the Technology Development phase for LIGO-India, IPR has successfully completed a 1:1 scale prototype fabrication of the 80K Cryopump and a 10 m long tube. These have been integrated into the LIGO-India Vacuum Integrated System Test Assembly (LI-VISTA) at IPR.
7. An AI software called DeepCXR developed by IPR has been extensively trained on real-life data under an MoU with ICMR. It is now yielding an accuracy of 97% for normal vs. abnormal images and for classifying abnormal images into TB vs. non-TB, which is better than AI tools developed in other countries. ICMR has now recommended its use in the National TB Screening program.

8. A pilot-scale integrated facility of copper-chlorine thermochemical cycle for nuclear hydrogen production has been installed and commissioned by BARC which has demonstrated production of hydrogen at 50 NL/h for 45 hours.
9. Hon'ble PM Inaugurated the 5 MLD capacity seawater desalination plant at Odisha Sands Complex of IREL(I) Ltd on 5th March 2024.
10. BARC has designed and developed single view and dual view X-ray baggage inspection systems with indigenous detectors, electronics and software
11. IGCAR in association with ISRO Telemetry, Tracking and Command Network (ISTRAC) has installed and commissioned a Mid-Tropospheric Wind Profiler for Atmospheric Studies, Weather forecasting and Nuclear Emergency Decision support system applications.
12. ECIL has played an important role in the General Elections of our country by supplying the EVMs. The ECIL developed EVM Management System 2.0 for Election Commission of India (ECI) which empowers the traceability of the EVM units during their movements (including vehicular tracking) from manufacturer (ECIL/ BEL) to the respective States and thereafter post randomisation to the respective polling booths was effectively utilized by all the stakeholders and well appreciated by the users.
13. A Liquid Nitrogen based reefer, based on technology developed by RRCAT has been commissioned at the Fishing Vessel of Central Institute of Fisheries Technology (CIFT) Kochi- 'Sagar Harita' and field testing with freshly caught fish has been successfully completed. Under Make in India initiative for defence sector, a 20 feet reefer container has been developed by RRCAT and tested successfully by Indian Navy with temperature and humidity control. Road trial was conducted by Indian Navy for transporting their special articles.

14. BRIT has developed and commissioned a low-temperature Irradiator using Co-60 radiation source to irradiate marine products at low and sub-zero temperature. The irradiation plant which is first of its kind in India will not only increase the shelf life of fresh marine products but also provide high quality food by eliminating pathogens. The Irradiator is expected to give a boost to radiation processing in the country.
15. BRIT has signed 2 MOUs for setting up gamma radiation processing facilities in private sector. 11 such facilities are in different stages of construction. As of now, 34 gamma radiation processing facilities are operational in India.
16. HWB has successfully produced and supplied nuclear grade solvents like TBP, TAPO, DHOA, etc. to NFC, IGCAR and NRB. Recently, a new facility for production of various solvents has been commissioned at Tuticorin. HWB has successfully synthesized a new solvent – CC6 based on BARC technology, for application in extraction of Cs-137 from spent fuel.
17. Water purification units/plants based on BARC technologies have been deployed in 200 equivalent villages, which included remote border outpost sites at Rajasthan & Gujarat and Central Railway, Mumbai.

D. *DAE continues to prioritise basic and directed research and our scientists and engineers are not only delivering on several front-end research areas but are also shaping and guiding the contour and path of the country's vision towards scientific research.*

1. As part of activities steered by the office of PSA, TIFR played the role of a nodal scientific institution and led the preparation of the 'Mega Science Vision – 2035' documents in Nuclear Physics and High Energy Physics.

These documents present 15-year roadmaps in the field of nuclear and high-energy physics.

2. As part of the mega science projects being pursued at DAE, India has become a full member of the SKAO after India ratified the treaty a few months back. The Indian participation in SKA is a nationwide, inclusive project led by a consortium of more than 20 academic and research institutes, with NCRA-TIFR as the nodal institute. This is a major step forward for astronomy in the country and will allow India to contribute technologically at the highest level and benefit scientifically from the use of the SKAO, which will be the most sensitive facility for radio-astronomers.
3. The TIFR Balloon Facility, Hyderabad has designed and fabricated four double-layer oblate spheroid-shaped balloons using 38-micron Antrix balloon film. These were designed for satellite payload testing applications at the U R Rao Satellite Centre in Bengaluru.
4. The National Facility for Neutron Beam Research (NFNBR) at Dhruva reactor has been utilised by more than 75 research groups from various universities and institutions resulting in more than 50 research papers.
5. Indus Synchrotron radiation sources at RRCAT were operated as a national facility in round-the-clock mode and more than 1000 user experiments have been performed. The Indian pharmaceutical industry has also been using the beamlines for their product development activities besides other users from universities, institutes and R&D labs.
6. The role of C-8 arylated xanthine derivatives in inhibiting a-Synuclein fibrillation is being explored by UM-CEBS. This is a key factor behind Parkinson’s disease
7. NISER has pursued an industry collaboration with M/s Bharat Electronics Limited, M/s Micropack Pvt Ltd and M/s Karnataka Hybrid micro devices Ltd. for fabrication of 25 arrays of n-type silicon pad sensors on six-inch

wafers for the first time in India. This array is part of the prototype level R&D for the Forward Calorimeter (FOCAL) detector in ALICE at LHC-CERN.

E. DAE is making concerted efforts towards development and deployment of technologies, knowledge management, capacity building and human resource development.

1. "AIC π-Hub" has been incorporated as a Section-8 company at RRCAT with 100% equity holding by DAE. 12 technology transfer agreements and 8 incubation agreements have been signed with industries and startups and 3 products including a laser-based metal 3D printer have been commercially launched.
2. The Bhubaneswar node of UGC-DAE Consortium for Scientific Research has been inaugurated at IoPB and it emphasizes the significance of collaborative research with the university community and the effective utilization of DAE resources and manpower for advancement of scientific development in the eastern part of India. IoP Bhubaneswar has also launched an Integrated MSc-PhD Programme.
3. Mahamana Pandit Madan Mohan Malviya Cancer Centre and Homi Bhabha Cancer Hospital, Varanasi have got affiliated to Homi Bhabha National Institute as its second off-campus Centre. With this addition, HBNI will now have 12 Institutions under its fold. It is also a matter of great pride that in the NIRF Rankings announced recently by the Ministry of Education, HBNI has climbed to 6th rank from its previous ranking of 15 in 2023 in the research category. Similarly, in the university category, HBNI has climbed to the 16th position from 17th and to the 27th position from 30th in the overall category.

4. Under the unique idea of One DAE One Subscription (ODOS), DAE has signed consortium agreements with M/s. Wiley India Private Limited and with M/s. Springer Nature Group. This has enabled to bring about 60 units and sub-units of DAE under one umbrella for access to national and international research papers as well as scientific journals.
5. DAE has launched a "DAE Digital Library" on 26th January 2024 which is a crucial step in digitizing the extensive knowledge resources of DAE and aligning with the vision of using technology to enhance accessibility and cultivating a culture of continuous learning.
6. I would like to convey our gratitude to the teachers in our 30 schools and junior colleges under AEES, who are mentoring our next generations and contributing to the human resource development of the country.

F. In the past one year, *quite a few National and International Awards and Recognitions have been bestowed upon the DAE fraternity. I would like to share my joy with you for these recognitions.*

1. Indian students, *mentored by TIFR*, have registered stellar performances at the 5 International Olympiads in Biology, Mathematics, Physics, Chemistry and Astronomy & Astrophysics
   a. The Indian team has bagged one gold and three silvers at the International Biology Olympiad in Astana, Kazakhstan.
   b. All five Indian participants in the 54th International Physics Olympiad held in Isfahan, Iran, during July 21-29, 2024 have bagged 2 Gold and 3 Silver medals.
   c. All four Indian students have achieved podium finishes at the 56th International Chemistry Olympiad held in Riyadh, Saudi Arabia, during July 21-30, 2024 by winning 1 Gold, 2 Silver, and 1 Bronze medal.

d. Indian students have excelled with 4 Gold, 1 Silver, and 1 Honorary Mention at the International Mathematics Olympiad 2024 held in Bath, UK, in July 2024. This was India's best performance to date at the IMO.

e. Indian students have secured 4 Gold and 1 Silver at the 16th International Olympiad on Astronomy and Astrophysics (IOAA 2023) held in Poland in August 2023.

2. From amongst the National Science & Technology Awards,
   a. Dr. A. K. Tyagi from HBNI and Prof Naba Mandal from SINP have been conferred with the prestigious Vigyan Shri in the field of Atomic Energy and Physics respectively.
   b. Prof. Vivek Polshettiwar has been awarded Vigyan Yuva Puraskar in the field of Chemistry. These awards are part of the Rashtriya Vigyan Puraskar instituted by the Government this year.
3. Prof. Meena Mahajan from IMSc and Prof. Bedangadas Mohanty of School of Physical Sciences from NISER have received the J.C. Bose Fellowship of the Department of Science and Technology.
4. Our students from the AEES schools across the country have won recognition in academics, music, painting, sports, athletics and NCC. As an outstanding example, Kumari U L Nethra of class IX at AECS-2, Kalpakkam has won the Chief Minister's cash prize of ₹ 15000/- for her skill in Tirukkural recitation. Kumari U L Nethra had also obtained the title of 'Arena Candidate Master' by the International Chess Federation, FIDE.
5. This year during July 2024, DAE participated in the science exhibition "Government Achievements & Schemes Expo 2024" held at Pragati Maidan, New Delhi and was awarded with the 1st prize for excellence in atomic energy.

While we continue to strengthen our focus in our mandated areas, our Service Organizations like DCSEM, DPS and GSO have continued to support, facilitate and augment the Department's infrastructure. DCSEM has successfully completed several construction projects for the augmentation of infrastructure for various units of DAE besides adding facilities for welfare of the employees and their families. DPS has been successful in achieving 100% of its eligible procurement through GeM and GSO has successfully constructed and developed a 9000 sq. m. bio diversity park in the Anupuram Township at Kalpakkam.

In order to create awareness and build a positive perception about multi-dimensional beneficial effects of nuclear energy to mankind and environment, DAE continues to implement its various outreach programs in mission mode.

I would also like to sincerely acknowledge the dedication of our health care professionals, security professionals and administrative/ technical/ scientific staffs. They not only keep us safe, secure & healthy but also keep the system in working order.

In the end, I once again thank you for all your efforts and urge you all to continue to our contributions in the service of nation in the true spirit of 'Atoms-in-service-of-nation' and stand up to fulfil our responsibilities towards a Viksit Bharat.

Jai Hind.