



## **Republic Day January 26, 2023 Address**

**Shri K. N. Vyas**

**Chairman, Atomic Energy Commission &  
Secretary, Department of Atomic Energy**

Dear Colleagues,

At the outset, please accept my heartiest greetings on the occasion of the 74<sup>th</sup> Republic Day of our great nation. We are also in the 75<sup>th</sup> year of the formation of Atomic Energy Commission. AEC has steered the activities of DAE and taken it from strength to strength over the last 75 years. I take this opportunity, on behalf of the entire DAE family, to extend my sincere gratitude and homage to all our stalwarts and predecessors.

It's Vasant Panchami today, which marks the onset of spring, and is also celebrated as the birthday of Goddess Saraswati, the goddess of knowledge, wisdom, speech, learning, music and art. My greetings to all on the occasion of Vasant Panchami as well.

As has been our tradition, we assemble every year on this solemn occasion to celebrate the achievements of the previous year and pledge our commitments to the future programmes. The Department of Atomic Energy is one of the earliest scientific organisations of independent India, founded by our visionary leader, Dr Homi Jehangir Bhabha. It has grown and delivered much that the nation can be proud of over the decades. Not only has it made India self-reliant in the field of nuclear science and technology, it has also played an important role in shaping the direction of several areas of basic and applied research and cutting-edge technologies in the country.

DAE comprises a large number of industrial and manufacturing units, research centres, power plants, medical centres, educational institutes etc. The breadth and scope of our activities are vast and varied, and the list of achievements is long. I will now describe some of the salient developments and achievements of DAE during the last one year in the following paragraphs.

I'll commence with the contributions of our Industrial Units during the year.

1. NPCIL is the power generating unit of DAE. Developments and achievements of NPCIL during this period are as follows
  - Generation of a record 46195 MU of clean power in 2022, at a Plant Load factor of 86.44%.
  - Cumulative safe operation of about 583 reactor-years till date.
  - Continuing with the trend of setting records, TAPS-4, RAPS-3, KGS-3 and KGS-4 have now been operating uninterrupted for more than a year, adding up to 42 instances of uninterrupted operations of more than a year for NPCIL reactors.
  - At KKNPP 5 & 6, largest pour of concrete of about 11,000 cu. m. in TB-6 raft has been completed.
  - Excavation for the first pair of the 10 fleet mode reactors in the pipeline has commenced at Kaiga for Kaiga 5&6.
2. AMD, the prospecting and exploration unit OF DAE, has continued to augment its in-situ uranium oxide ( $U_3O_8$ ), Rare Metal and Rare Earth and economic heavy mineral resources. In addition, 17 uranium and Beach Sand Mineral(s) mines were inspected by AMD for regulation and conservation of atomic minerals.
3. IREL, the atomic minerals processing entity of DAE has an established plant capacity of about 6 lakhs tons per annum. IREL is establishing facilities for production of 4N Yttrium oxide for strategic applications. It is indeed creditable that IREL has consistently grown at a rate of about 30% for the last 6 years, except during the year impacted by Covid.
4. UCIL, the unit responsible for Uranium production in the country, has met the  $U_3O_8$  production targets. The Tummalapalle unit is all set to achieve the highest ever uranium production during 2022-23. UCIL has received the Letter of Intent for granting of Mining Lease from the Govt. of Rajasthan for the Rohil Uranium Project. This would enable the setting up of a mine and mill, significantly enhancing Uranium production in the country. A project for setting up a facility for production of 'Heat Treated Uranium Peroxide' in

place of 'Sodium Di-Uranate (SDU) at Tummalapalle, similar to the one in Jharkhand region, has been awarded to M/s. MECON.

5. NFC has been a vital cog in India's nuclear power programme. It has attained complete mastery and self-reliance in fuel production and has achieved a highest ever annual production of 26.4 Lakh fuel tubes During the calendar year 2022. NFC has evolved into a multi-faceted organization, catering not only to the requirements of DAE, but also to the strategic requirements of the country in space and defence related applications. I shall now mention some of the important achievements and contributions of NFC during this period:
  - Development of a 360kW Vacuum Arc Re-melting furnace for production of 280 mm diameter primary melted Zircaloy ingot with completely indigenously developed mechanical assemblies.
  - Development of processes for production of an advanced Ni-based super alloy and Nb55Ti alloy using electron beam melting and vacuum arc re-melting.
  - The above two developments have led to Foreign Exchange savings of approx. Rs. 10 Crores to the nation.
  - NFC has also indigenously developed new State-of-Art Automated Machining Center for automated machining of Billets of various sizes and grades and commissioned a completely automated tube ID cleaning system for final pass fuel clad tubes. These developments have resulted in increased UT recoveries, improved productivity and the flexibility for carrying out varied jobs at a time.
6. BRIT has continued to play a vital role for the products and services based on radiation & isotopes for applications in healthcare, agriculture, research and industry. Some noteworthy achievements are as follows:
  - The Installation and commissioning of Fission Moly Plant for the production of medical grade high specific activity Mo-99 has been accomplished and medical grade fission Mo-99 has been produced in the country for the first time.
  - Two new radiopharmaceutical products, 68Ga-PSMA-11 and 68Ga-DOTA-TATE, for Prostate Cancer Diagnosis and Breast

- Cancer & Neuroendocrine Tumor Diagnosis, respectively, were developed and supplied to nuclear medicine centers in Kolkata. This followed the successful production of  $^{68}\text{GaCl}_3$  radiochemical from  $^{68}\text{Zn}$  target, at Regional Centre/Kolkata, using Medical Cyclotron, Cyclone-30.
- Kolkata center of BRIT has also developed technology for in-house production of Ge-68 in 30 MeV Medical Cyclotron using Ga-Ni alloy target.  $^{68}\text{Ge}$  will be used for the regular production of  $^{68}\text{Ge}$ - $^{68}\text{Ga}$  generators, which are presently being imported by our nuclear medicine centers.
  - 32 radiation processing facilities under MoUs with BRIT are currently operating in India and more MoUs are being signed by BRIT with private entrepreneurs for setting up of Gamma Radiation Processing Plants for disinfestation, shelf-life extension of food products and sterilization of healthcare products. Five Radiation Processing Plants in the country have been commissioned during this year with assistance from BRIT.
  - BRIT has emerged as a leading supplier of Co-60 tele therapy sealed sources for affordable cancer radiotherapy and is the leading exporter of irradiator source pencils.
  - BRIT has designed a Mobile Food Irradiator which is currently undergoing regulatory review.
7. Heavy Water Board (HWB), continues to deliver on its mandate for the supply of nuclear materials like Heavy Water for PHWRs, organo-phosphorus solvents for front and back-end of nuclear fuel cycle,  $^{10}\text{B}$  enriched boron carbide, NG sodium for FBR etc., production of Hydrogen, production of O-18 for medical applications, and production of deuterated products in India are other projects of significance.
8. ECIL has the mandate for development and manufacture of electronics and instrumentation systems for DAE, ISRO and defense sectors of India. ECIL is also actively engaged in the manufacture of EVM/VVPAT for the Election Commission of India. Some of the recent contributions of ECIL are as follows:

- A Remote Voting Machine for voters to exercise their franchise from a remote location has been developed and demonstrated to the Election Commission of India.
- Hydrogen and Steam Concentration Monitoring System (HSCMS) which was designed by BARC has been developed, qualified and commissioned at KAPP-3.
- Alpha and Beta Aerosol Monitor, Spectroscopic Iodine Monitor, Inert Radioactive Gas monitor, Process Media Monitor and Accident Monitor as part of its Advanced Radiation Monitoring System for Nuclear Power Plants have been developed by ECIL.

I shall now move on to some of the noteworthy contributions of the premier research centers of DAE.

1. BARC, the mother institute of DAE, continued its excellent contribution to the development of advanced technologies and societal applications in several areas.
  - The Atal Incubation Centre of BARC has signed agreements for incubation of spin-off technologies for an Alkaline Water Electrolyser for Green Hydrogen production, DC Accelerator for waste water treatment & radiation processing applications, X-Band LINAC based X-ray source for radiotherapy machine and technology for growth of single large dimension Cesium Iodide Crystals with four MSMEs. These technologies are likely to play a major role towards de-carbonization of environment, minimization of contaminants in effluent water and indigenization of radiotherapy machines.
  - A Radiation Medicine Research Centre has been set up in Kolkata for providing state-of-art and affordable nuclear medicine services to about 10,000 patients from the East and North Eastern States annually.
  - BARC has deployed its water purification units in 81 rural/remote sites of India including a 12,500 LPH capacity water purification unit at Sandeep Border Outpost on the Indo-Pak Border in the Kutch region of Gujarat.

2. IGCAR is the hub for R&D on fast breeder reactor technology. Some of the important contributions are as follows
  - The Fast Breeder Test Reactor which is the flagship reactor of the second stage of our nuclear power programme has completed a cumulative Effective Full Power Days of operation of 128 days producing 23.5 million units of electricity during 2022. The reactor was started in mid 1980s, the operation of the reactor till 2020s has involved considerable structural evaluations for obtaining necessary Regulatory Approvals. India is among a few countries having an ability to safely operate sodium cooled reactors.
  - A Pyro-Process R&D Facility has been set-up and commissioned for reprocessing of spent metallic fuels from FBRs and electro-refining of 10 kg uranium metal has been successfully demonstrated in this facility.
  - A remote In-Service-Inspection vehicle (DISHA) for in-situ monitoring of dissimilar weld joints in reactor vessel in the PFBR has been indigenously developed, qualified and deployed in the PFBR reactor vault for pre-service as well as in-service inspections.
  - The design modifications and rectifications on 724 Dummy Sub-Assemblies have been completed and loaded back on the grid plate in the PFBR and an application for filling the Main PFBR vessel has been submitted to AERB for review and regulatory clearances.
3. RRCAT, the centre at the helm of R&D in the field of lasers and accelerators has the following salient deliverables during this period.
  - The Synchrotron Radiation Sources Indus-1 and Indus-2 have continued to be operated as a National Facility with beam availability of about 6900 hrs and 5600 hrs respectively and 991 user experiments have been carried out in the Indus beamlines.
  - RRCAT developed electron LINAC facility at Indore has been utilized for sterilization of more than 5 lakh individual devices.
  - A 10 MeV, 10 kW electron linear accelerator developed at RRCAT has been offered for operation in industrial environment

and an agreement has been signed for this purpose with a private industry.

- The technology named 'SHIVAY' for liquid Nitrogen based refrigeration and transport of perishable items has been selected by INAE's task force as one among the 75 landmark technologies developed in India over the last 75 years.
4. VECC, Kolkata has the following noteworthy contributions during this period
- Human applications of Thallium-201 radioisotope indigenously produced for the first time in India in a joint venture of VECC & BRIT at the Medical Cyclotron Facility, have been successfully carried out at various hospitals in Kolkata.
  - A new Radioactive Ion Beam of  $^{11}\text{C}$  has been produced through  $^{14}\text{N}(p, \alpha)^{11}\text{C}$  reaction in RIB Facility at VECC.

The aided institutions of DAE namely TIFR, IPR, SINP, TMC, HCRI, IOP, IMSc, HBNI, NBHM, UM-DAE CEBS, and NISER have continued to pursue advanced and cutting-edge fundamental research in the field of basic sciences, astronomy, astrophysics, and education. Some of the accomplishments and milestones worthy of mention are the following:

1. At TIFR, the concepts of classical helio-seismology have been successfully applied to image the Sun's interior rotation and structure.
2. The test flight of the Space Exploration Capsule of M/s Halo Space (Spain) has been successfully completed using a plastic balloon designed and fabricated at TIFR Balloon Facility, Hyderabad.
3. Prof. Bedangadas Mohanty of NISER, Bhubaneswar has been elected as the Deputy Spokesperson of ALICE experiment at Large Hadron Collider in CERN.
4. Integrated MSc-PhD programs in Mathematical Sciences, Chemical Sciences and Biological Sciences have been launched at NISER.
5. Prof. Sudhakar Panda, Director NISER, has been awarded the prestigious 'Biju Patnaik Award for Scientific Excellence' by Odisha Bigyan Academy, Govt. of Odisha, in recognition of his outstanding life-time contributions to Science and Technology

6. IPR has completed assembly of the Top Lid Sectors of the Cryostat at ITER tokamak and has also developed and patented AGATSYA-400, a Liquid nitrogen-cooled sorption cryopump for pumping of the vacuum vessel of the SST-1 Tokamak.
7. An ITER-India Gyrotron Test Facility has been established at IPR to enable integrated testing and performance demonstration of high power Gyrotrons procured from abroad.
8. The Homi Bhabha Cancer Hospital and Research Centre, Mullanpur was inaugurated by our Hon'ble Prime Minister on 24.08.2022. In this context, it is a matter of pride that the work carried out by TMC, especially for diagnosis and treatment of breast cancer cases, has received commendation from the Hon'ble Prime Minister of India. In the year 2022 a total 18,34,042 Nos of cases were dealt by all the Centers of TMC, which includes 1,44,838 Nos of new cases and 16,89,204 Nos of follow-up cases.

Our principal service organisations, DPS and DCSEM, have made important contributions towards fulfilling the departmental mandates. The following are noteworthy contributions:

- Construction of 100 bedded Cancer hospital for the TMC project at Vizag and the Radiation Medicine Research Centre at VECC Rajarhat Campus, Kolkata have been completed by DCSEM.
- DPS has achieved the distinction of being one of the top ten governmental departments to process all tenders through the Central Public Procurement Portal.
- I also take this opportunity to extend my greetings to the DCSEM family for completing its silver jubilee and the DPS family for completing its golden jubilee in 2022.

Global Centre for Nuclear Energy Partnership (GCNEP), Bahadurgarh, has conducted international workshops in the area of Nuclear Security, Radiological Safety, Safeguard and Advanced Nuclear Energy Systems during this period. It has also established a state of the art "Sensor Evaluation Test Bed Facility (SETBF)" for testing & evaluation of Physical Protection System Intrusion Sensors.



The Nuclear Controls and Planning Wing (NCPW) at the DAE Secretariat, has pursued its mandated engagements on civil nuclear cooperation with various countries, IAEA safeguards and institutional collaborations towards harmonization of India's export control list for strategic materials, equipment, and technology with respect to the Nuclear Supplier group and Wassenaar Arrangement

As part of its public outreach activities during the year DAE:

- has published two illustrated picture books titled 'The Nobel Curies' and 'Dr. Vikram Sarabhai' as part of its 'Eminent Scientists Series' for children.
- a Delhi-Mumbai Cyclothon with the theme – 'Chain Reaction' was also conducted as a first-of-its-kind science outreach effort to spread awareness about nuclear energy as a clean, green and safe source of energy.

An Online Software Application 'E-SAFAR' (Electronic Software Application for Foreign Deputation and Arrival) has been developed and put into operation at all our units for processing of foreign deputation proposals.

As you all are aware, AERB is an independent regulator ensuring radiological safety and health aspects for the entire country. AERB continued to work diligently towards ensuring sustainable and safe use of nuclear energy and radiation technology in the country. Some recent initiatives and activities are as follows:

- The process of simplification of its regulatory mechanisms aimed towards minimum governance has been commenced as a part of Government's initiative on National Single Window System.
- As part of its mandate, AERB continued to monitor occupational doses, environmental releases and public exposures from nuclear facilities. Measured parameters were found to be well within the specified limits at all locations.
- Integrated Regulatory Review Mission of IAEA had visited India on the invitation of the Indian Government and commended

AERB for the strong commitment and professionalism shown towards ensuring nuclear and radiation safety in the country. The launch of e-LORA online platform of AERB for e-Licensing of Radiation Applications received special appreciation. During the year through e-LORA, AERB has issued 23307 Nos of licenses for medical and 1367 Nos of licenses for other purposes across the country.

Dear Colleagues, the list of achievements is long and unending, and I have been able to mention only some of the salient contributions in the time available. However, I would like to take this opportunity to compliment and thank all members of the DAE family for their sustained efforts. The work for development and progress always remains ongoing and limitless, needing continuous efforts from each one of us. I would like to urge all members of the DAE family to treat every job as a mission, and work tirelessly to achieve goals and mandates set by the department.

I would like to sincerely thank all our Scientific, Technical, Administrative and security personnel who have worked hand in hand with us towards making the programmes of the Department a great success. They create the framework for facilitating our tasks and are a vital segment of our work force.

Once again wishing all of you a very Happy Republic Day. Thank you.

Jai Hind

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