

**Indian experience in capacity
building as a part of
development of atomic energy
programme**

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Attributes of Nuclear Technology

- Nuclear technology is knowledge intensive.
- Needs well trained human resource and strong industrial infrastructure for its exploitation.
- Needs synergistic pursuit of basic research and technology development.

Development in India

- **Tata Institute of Fundamental Research**
– **December 1945.**
- **Department of Atomic Energy**
– **August 1954.**
- **Research Centres, Industrial Units, Public Sector Units, Autonomous Research Institutes, Agencies for Extra-mural Funding.**

ATOMIC ENERGY COMMISSION

ATOMIC ENERGY REGULATORY BOARD

DEPARTMENT OF ATOMIC ENERGY

DAE Science Research Council

R&D ORGANISATIONS

Bhabha Atomic Research Centre, Mumbai

Indira Gandhi Centre for Atomic Research, Kalpakkam

Centre for Advanced Technology, Indore

Variable Energy Cyclotron Centre, Kolkata

Atomic Minerals Directorate for Exploration & Research, Hyderabad

PUBLIC SECTOR UNDERTAKINGS

Nuclear Power Corp. of India Ltd., Mumbai

Uranium Corp. of India Ltd., Jaduguda

Indian Rare Earths Ltd., Mumbai

Electronics Corp. of India Ltd., Hyderabad

Bharatiya Nabhikiya Vidyut Nigam Ltd., Kalpakkam

INDUSTRIAL ORGANISATIONS

Heavy Water Board, Mumbai

Nuclear Fuel Complex, Hyderabad

Board of Radiation & Isotope Technology, Mumbai

SERVICE & SUPPORT ORGANISATIONS

Directorate of Purchase & Stores, Mumbai

Directorate of Construction, Services & Estate Management Group, Mumbai

General Services Organisation, Kalpakkam

Board of Research in Nuclear Sciences,
National Board of Higher Mathematics

FULLY AIDED INSTITUTIONS

Tata Institute of Fundamental Research, Mumbai

Tata Memorial Centre, Mumbai

Saha Institute of Nuclear Physics, Kolkata

Institute of Physics, Bhubaneshwar

Harish-Chandra Research Institute, Allahabad

Institute of Mathematical Sciences, Chennai

Institute for Plasma Research, Ahmedabad

Atomic Energy Education Society,

Present status

- 14 reactors are in operation
- 9 reactors are under construction
2x540 MWe PHWRs, 4x220 MWe PHWRs, 2x1000 MWe VVERs, 500 MWe PFBR
- Expertise on all aspects of fuel cycle
- Radiation technology applications
- Pool of well trained professionals

Insights based on our experience

- **R&D is necessary for progress. R&D by itself is not enough. Knowledge by R&D must lead to deployment of technologies and diffusion of knowledge.**
- **While new research is important, adaptation of known technologies and their continued improvement is also very challenging**

Insights based on our experience

(Contd.)

- **Acknowledge attributes of partners.**
- **Industry is looking for profits – that too in short term.**
- **University researchers are looking for challenges leading to problems to be solved by research students as a part of degree requirements**

Insights based on our experience

(Contd.)

- Policy framework to remove entry barriers
- Insulate technology development from short-term political pressures.
- Earning technology development fee is less important than deploying the technologies, improving the level of industry and then outsourcing hi-tech problems to industry

Insights based on our experience

(Contd.)

- **Education and research are complimentary activities**
- **The first degree should be as broad as possible**
- **Specialized courses—hire and train**
- **KM includes archiving, human resource development, technology transfer and technology assessment**

Recent initiative

- **Include training programmes at some elite educational institutions as a part of DAE schemes.**
- **Projects under the guidance of two advisers**
- **Resource persons for carrying out research in areas of interest to atomic energy**

New initiative

**Setting up of a virtual university linking
all DAE institutions to expedite
translation of basic research into
deployable technologies through the
medium of students**

Technology Management

- **In-house technology transfer**
- **In-house technology deployment**
- **Development of indigenous vendors**
- **Technology transfer to outside agencies**
- **Technology diffusion**

Basic Concepts

- **Composite character of the institutions**
- **Setting up of linkage at the development stage**
- **Transfer of personnel to transfer technology**
- **Adjunct positions**
- **Hand holding for implementation of the technology by the licensee**
- **Linkages with other agencies**

**Development of individuals
is central to knowledge
management**