

DEPARTMENT OF ATOMIC ENERGY**DEMAND NO. 5****Atomic Energy**

A. The Budget allocations, net of recoveries, are given below:

<i>(In crores of Rupees)</i>										
Major Head	Budget 2002-2003			Revised 2002-2003			Budget 2003-2004			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
Revenue	240.04	760.67	1000.71	201.59	789.70	991.29	180.50	660.42	840.92	
Capital	664.96	325.33	990.29	493.41	310.30	803.71	619.50	409.09	1028.59	
Total	905.00	1086.00	1991.00	695.00	1100.00	1795.00	800.00	1069.51	1869.51	
1. Secretariat-Economic Services	3451	...	9.97	9.97	...	10.58	10.58	...	11.59	11.59
	5401	1.33	...	1.33	1.82	...	1.82	2.00	...	2.00
<i>Total</i>		1.33	9.97	11.30	1.82	10.58	12.40	2.00	11.59	13.59
Atomic Energy Research and Industries										
2. Bhabha Atomic Research Centre										
2.01 Research & Development	3401	1.00	346.50	347.50	...	339.62	339.62	...	354.04	354.04
<i>Total</i>		1.00	346.50	347.50	...	339.62	339.62	...	354.04	354.04
2.02 Industrial Projects	2852	...	138.28	138.28	...	135.29	135.29	...	144.96	144.96
2.03 Capital Projects	4861	165.81	...	165.81	139.00	...	139.00	140.00	...	140.00
	5401	185.00	...	185.00	120.00	...	120.00	140.00	...	140.00
<i>Total</i>		350.81	...	350.81	259.00	...	259.00	280.00	...	280.00
Total - BARC		351.81	484.78	836.59	259.00	474.91	733.91	280.00	499.00	779.00
3. Indira Gandhi Centre for Atomic Research, Kalpakkam										
3.01 Operation of Fast Breeder Test Reactor & Other Facilities	3401	6.50	71.80	78.30	...	81.23	81.23	...	82.50	82.50
3.02 Capital Projects (I&M)	4861	15.00	...	15.00	8.33	...	8.33	20.00	...	20.00
3.03 Capital Projects (R&D)	5401	25.50	...	25.50	25.50	...	25.50	35.00	...	35.00
Total - IGCAR		47.00	71.80	118.80	33.83	81.23	115.06	55.00	82.50	137.50
4. Centre for Advanced Technology, Indore	3401	...	24.29	24.29	...	30.70	30.70	...	30.40	30.40
	4861	1.20	-0.50	0.70	1.95	...	1.95	0.24	...	0.24
	5401	45.00	...	45.00	45.88	...	45.88	50.00	...	50.00
Total - CAT		46.20	23.79	69.99	47.83	30.70	78.53	50.24	30.40	80.64
5. Variable Energy Cyclotron Centre, Kolkata	3401	...	17.01	17.01	...	18.61	18.61	...	18.30	18.30
	5401	26.00	...	26.00	21.48	...	21.48	23.00	...	23.00
<i>Total</i>		26.00	17.01	43.01	21.48	18.61	40.09	23.00	18.30	41.30
6. Directorate of Purchase & Stores, Mumbai	3401	...	10.38	10.38	...	12.51	12.51	...	10.00	10.00
7. Directorate of Construction, Services and State Management, Mumbai	3401	8.05	46.83	54.88	3.70	62.51	66.21	3.00	51.98	54.98
8. General Services Organisation, Kalpakkam	3401	...	18.54	18.54	...	20.19	20.19	...	18.95	18.95
9. Tata Institute of Fundamental Research, Mumbai	3401	38.00	67.63	105.63	33.10	67.94	101.04	35.00	71.75	106.75
10. Tata Memorial Centre, Mumbai	3401	27.00	53.91	80.91	34.20	54.58	88.78	35.40	63.70	99.10
11. Saha Institute of Nuclear Physics, Kolkata	3401	17.00	16.00	33.00	17.13	16.57	33.70	18.00	17.25	35.25
12. Grant to other Institutions										
12.01 Institute of Physics, Bhubneswar	3401	3.94	5.46	9.40	2.07	5.81	7.88	3.10	7.00	10.10
12.02 Harish-Chandra Research Institute, Allahabad	3401	3.41	5.04	8.45	1.77	5.20	6.97	2.50	6.80	9.30
12.03 Institute of Mathematical Sciences, Chennai	3401	1.30	6.36	7.66	1.03	6.60	7.63	2.50	7.33	9.83
12.04 Institute for Plasma Research, Gandhinagar	3401	62.00	7.77	69.77	50.00	8.50	58.50	28.00	26.00	54.00
12.05 Grants to Other Institutions	3401	34.35	...	34.35	50.10	...	50.10	47.00	...	47.00
<i>Total</i>		105.00	24.63	129.63	104.97	26.11	131.08	83.10	47.13	130.23

(In crores of Rupees)

	Major Head	Budget , 2002-2003			Revised, 2002-2003			Budget, 2003-2004		
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
13. Housing Projects (Capital)	5401	39.25	...	39.25	16.25	...	16.25	22.00	...	22.00
14. Atomic Minerals Directorate for Exploration and Research, Hyderabad	3401 4861 5401 <i>Total</i>	... 7.98 6.37 14.35	45.77 45.77	45.77 7.98 6.37 60.12	... 7.98 6.37 14.35	48.30 48.30	48.30 7.98 6.37 62.65	... 9.42 15.00 24.42	48.25 48.25	48.25 9.42 15.00 72.67
Nuclear Fuel										
15. Nuclear Fuel Complex (NFC), Hyderabad										
15.01 Fuel Fabrication Facilities:										
Gross	2852	...	574.40	574.40	...	574.40	574.40	...	381.75	381.75
Less-Receipts	0852	...	-770.96	-770.96	...	-775.38	-775.38	...	-766.00	-766.00
Net		...	-196.56	-196.56	...	-200.98	-200.98	...	-384.25	-384.25
15.02 Common Services	2852	...	3.90	3.90	...	3.46	3.46	...	4.16	4.16
15.03 Steel Tubes Plant	2852	...	15.41	15.41	...	15.41	15.41	...	15.95	15.95
15.04 Capital Projects of NFC	4861	12.00	...	12.00	13.02	...	13.02	22.00	...	22.00
Total-Nuclear Fuel Complex		12.00	-177.25	-165.25	13.02	-182.11	-169.09	22.00	-364.14	-342.14
Heavy Water										
16. Heavy Water Projects										
16.01 Maintenance of Housing Colonies for Heavy Water Plants	2852	...	5.23	5.23	...	5.16	5.16	...	5.58	5.58
16.02 Other HeavyWater Plants	4861	34.00	4.81	38.81	29.67	5.63	35.30	15.34	5.58	20.92
Total-Heavy Water Projects		34.00	10.04	44.04	29.67	10.79	40.46	15.34	11.16	26.50
17. Heavy Water Production										
17.01 Heavy Water Plant, Baroda	4861	...	26.76	26.76	...	16.49	16.49	...	50.84	50.84
17.02 Heavy Water Plant, Kota	4861	...	74.85	74.85	...	84.78	84.78	...	92.97	92.97
17.03 Heavy Water Plant, Tuticorin	4861	...	56.90	56.90	...	50.09	50.09	...	53.98	53.98
17.04 Heavy Water Plant, Talcher	4861	...	6.52	6.52	...	6.31	6.31	...	7.58	7.58
17.05 Heavy Water Plant, Thal	4861	...	83.34	83.34	...	62.21	62.21	...	76.98	76.98
17.06 Heavy Water Plant, Hazira	4861	...	81.31	81.31	...	90.42	90.42	...	94.13	94.13
17.07 Heavy Water Plant, Manuguru	4861	...	124.84	124.84	...	111.85	111.85	...	138.47	138.47
<i>Total</i>		...	454.52	454.52	...	422.15	422.15	...	514.95	514.95
Less- Loss of Heavy Water	4861	...	-142.50	-142.50	...	-121.98	-121.98	...	-111.69	-111.69
Net		...	312.02	312.02	...	300.17	300.17	...	403.26	403.26
Total - Heavy Water		34.00	322.06	356.06	29.67	310.96	340.63	15.34	414.42	429.76
18. Board for Radiation and Isotope Technology, Mumbai	2852 4861 <i>Total</i>	... 8.01 8.01	25.01 ... 25.01	25.01 8.01 33.02	... 6.45 6.45	25.90 ... 25.90	25.90 6.45 32.35	... 8.00 8.00	27.80 ... 27.80	27.80 8.00 35.80
19. Other Programmes	2852 3401 4861 5401 <i>Total</i>	... 1.00 15.00 3.00 19.00	5.23 10.91 9.00 ... 25.14	5.23 11.91 24.00 3.00 44.14	... 1.00 8.26 2.93 12.19	3.59 12.42 4.50 ... 20.51	3.59 13.42 12.76 2.93 32.70	... 1.00 21.00 1.50 23.50	5.77 14.61 0.25 ... 20.63	5.77 15.61 21.25 1.50 44.13
20. Grants-in-aid to Electronics Corporation of India Limited	2852	7.49	...	7.49	7.49	...	7.49	4.00	...	4.00
21. Implementation of VRS										
i. Electronics Corporation of India Ltd.	2852	29.00	...	29.00	...	...	...	1.00	...	1.00
22. Investments in Public Enterprises										
i. Electronics Corporation of India Ltd.	4859	3.51	...	3.51	3.52	...	3.52	5.00	...	5.00
ii. Uranium Corporation of India Ltd.	4861	70.00	...	70.00	35.00	...	35.00	80.00	...	80.00
iii. Indian Rare Earths Ltd.	4861	1.00	...	1.00	...	...	...	10.00	...	10.00
<i>Total</i>		74.51	...	74.51	38.52	...	38.52	95.00	...	95.00
Total-Atomic Energy Research and Industries		903.67	1076.03	1979.70	693.18	1089.42	1782.60	798.00	1057.92	1855.92
Grand Total		905.00	1086.00	1991.00	695.00	1100.00	1795.00	800.00	1069.51	1869.51

		<i>(In crores of Rupees)</i>								
Head of Dev.	Budget, 2002-2003			Revised, 2002-2003			Budget, 2003-2004			
	Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total	
B. Investment in Public Enterprises										
1. Electronics Corporation of India Ltd.	12859	3.51	5.00	8.51	3.52	5.00	8.52	5.00	15.00	20.00
2. Uranium Corporation of India Ltd.	12861	70.00	50.54	120.54	35.00	42.00	77.00	80.00	60.00	140.00
3. Indian Rare Earths Ltd	12861	1.00	64.06	65.06	...	25.00	25.00	10.00	61.10	71.10
Total		74.51	119.60	194.11	38.52	72.00	110.52	95.00	136.10	231.10
C. Plan Outlay										
1. Telecommunication and Electronics Industries	12859	3.51	5.00	8.51	3.52	5.00	8.52	5.00	15.00	20.00
2. Atomic Energy Industries	12861	366.49	114.60	481.09	257.15	67.00	324.15	331.00	121.10	452.10
3. Atomic Energy Research	13401	535.00	...	535.00	434.33	...	434.33	464.00	...	464.00
Total		905.00	119.60	1024.60	695.00	72.00	767.00	800.00	136.10	936.10

1. **Secretariat – Economic Services** - DAE Secretariat is the apex body administering the Constituent Units, PSUs and Aided Institutions spread all over the country. In the Department of Atomic Energy, there are five R&D Units, three Industrial Units and four PSUs apart from eight Aided Institutions. It has also a Branch Secretariat at New Delhi. The budget provision includes the DAE Secretariat and the Atomic Energy Commission.

2. **Bhabha Atomic Research Centre (BARC), Mumbai** – BARC, a multi-disciplinary organisation, continues its integrated research and development efforts in the fields of nuclear sciences, engineering & technology, basic sciences and allied fields. BARC is geared up to provide required support to ensure national safety under changed strategic environment.

Most of the goals set for the IX Plan have been realised. 72 projects were completed/closed. 34 projects are continuing and 61 new projects are taken up in X Plan to meet the further challenges in various programmes of the research centre. Continuous efforts are being made to ensure that the country remains self reliant in basic and strategic needs. Strong linkages are being maintained with other national laboratories and universities to achieve synergy in research and development programmes pursued by the Centre.

Towards utilisation of vast resources of thorium for power generation, BARC has been developing Advanced Heavy Water Reactor (AHWR). For this, required engineering development is progressing well.

Major milestones were achieved in the construction of Nuclear Desalination Demonstration Plant which was dedicated to the nation by the Prime Minister on October 31, 2002. He also declared open the same day five other facilities, viz. Krushak (Krusha Utpadan Sanrakshan Kendra) at Lasalgaon (Maharashtra), Medical Cyclotron-Positron Emission Tomography Facility at the Radiation Medicine Centre, and the refurbished research reactor CIRUS, Uranium Thorium Separation Facility and Waste Immobilisation Plant (WIP) at Trombay.

The actual list of achievements in BARC is very long to be covered in full and hence a very brief account has been highlighted.

BARC has developed ANUPAM-PIV 64-node supercomputer with a sustained speed of 43 giga flops (floating point instructions per second) which is 30 to 40 times faster than the parallel computer developed indigenously by other institutions, and more than 10 times faster than the fastest supercomputers imported from abroad.

ANUPAM-PIV is designed using Pentium IV personal computers operating at 1.7 GHz MB memory each. The computing speed is expected to improve further with the use of ultra-fast communication hardware.

BARC regularly makes available recesses/technologies developed for in-house to Indian industries for commercial exploitation. BARC assists these industries for quality assurance as well as for trouble shooting.

3. **Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam** – IGCAR a multi-disciplinary Research & Development unit of DAE, was established in 1971, with the focused mission of indigenous design and development of liquid sodium cooled Fast Breeder Reactors (FBR) in our country to meet the growing demand for electricity. The Centre has established comprehensive R&D facilities in various disciplines, including the closing of the fuel cycle for attaining self-sufficiency in FBR technology.

An experimental sodium cooled Fast Breeder Test Reactor (FBTR) has been in operation at IGCAR since 1985 with indigenously developed plutonium-uranium carbide fuel. The reactor has achieved a significant milestone in reaching a burn-up of 100 GWd/t on 3-9-2002, with the excellent performance of the sodium systems and also without any clad failure of the fuel.

The research reactor, Kalpakkam MINI (KAMINI), using Uranium-233 as fuel has been operating at its nominal power of 30 kW and is being used for neutron radiography and also for activation analysis.

The thrust of the R&D programme, at present, is aimed towards the construction of 500 MWe Prototype Fast Breeder Reactor (PFBR) and associated fuel cycle facilities. Significant progress has been made in the design of the systems and components of the Nuclear Steam Supply System (NSSS) and also for the balance of Plant. All the conceptual design aspects of the reactor have been frozen and specifications & drawings for the manufacture of major NSSS components are ready. The detailed design phase is in an advanced stage of completion. Efforts are also on hand to obtain the "No objection certificate" from the Ministry of Environment and Forests, after a public hearing and clearance by the Tamil Nadu Pollution Control Board.

4. **Centre for Advanced Technology (CAT), Indore** - CAT was established in 1987. During the past two-Plan periods, the Centre has established excellent infrastructure including workshops and R&D laboratories for carrying out Development and Research in Accelerators and Lasers.

In the Accelerator area, two important projects undertaken by CAT are the development of India's first Synchrotron Radiation Source (SRS), the 450 MeV Indus-I and the second SRS, the 2.5 GeV Indus-II. Indus-I has been in operation since 1999 has exceeded the design specifications i.e. a stored current of nearly 190 mA against the design value of 100 mA. With the experience gained in developing Indus-I, CAT has taken up development of

Industrial and Medical Accelerators. A 750 KeV DC Accelerator has been fully assembled and a Radiotherapy machine, which has a 6-12 MeV Variable Energy Microtone, is nearing completion.

The Department of Atomic Energy has entered into a major collaboration with European Council for Nuclear Research (CERN) for contributing to LHC, the world's largest Accelerator under construction. CAT is coordinating this collaboration and has developed some of the items namely super conducting sextupole and decapole corrector magnets, precision magnet positioning jacks, software etc.

The main thrust of the laser programme is to develop technologies of important lasers and explore their applications in industry, medicine as well as R&D. CAT has developed a 4 KW CO₂ laser, which is generally being used for cutting, welding and cladding applications. The Centre has also developed industrial Nd: YAG laser, which coupled with optical fibers is able to cut or weld metal sheets at the distance of 50 M. The mechanical fixtures for remotely cutting coolant tubes from nuclear reactors have also been developed.

5. Variable Energy Cyclotron Centre (VECC), Kolkata - VECC has been operating the nation's largest and the first indigenously built cyclotron in the country providing charged particle beams of various energies. VECC has developed expertise on accelerator technology and its applications. One of the significant developments is electron cyclotron resonance source (ECR), the latest state-of-the-art heavy ion source, which has been coupled to the cyclotron recently for accelerating heavy ion beams of 115 MeV Oxygen and 150 MeV of Neon etc. Using these heavy ion sources, the cyclotron is now ready for the experimentalists to carry out the second phase of experiments.

Based on the long experience gained by building and operating cyclotron, two major R&D accelerator projects in the high tech areas namely, the constructions of 1) K500 superconducting cyclotron and 2) Radioactive Ion Beam Facility have been undertaken. The projects are in advanced stage of execution.

In tune with the Department of Atomic Energy's program for extending the benefits of nuclear medicine facilities, VECC has set up a Regional Radiation Medicine Centre (RRMC) at Kolkata for the benefits of the economically backward community from the eastern part of India. The investigative and the treatment facilities include radio-immuno-assay for T3, T4 and TSH studies, Gamma cameras for nuclear imaging and organ function studies, rectilinear scanner for thyroid function and thyroid uptake studies and an indigenously built 4 MeV LINAC for radiation therapy.

6. Directorate of Purchase & Stores (DPS), Mumbai - DPS is engaged in procurement, custody and issue of equipments and materials required for Atomic Energy Programme being implemented through various Units of DAE. In addition to the purchase activities the Directorate is also disposing scrap and surplus declared by various Units.

7. Directorate of Construction, Services & Estate Management (DCS&EM), Mumbai - DCS&EM is responsible for construction, allotment and maintenance of residential flats to the employees of the constituent Units including PSUs working in and around Mumbai. In addition to residential houses, construction of office/laboratory buildings, infrastructural facilities of schools, etc. is also undertaken. The provision made in this head includes the budget provision Atomic Energy Education Society (AEES), Mumbai and Atomic Energy Central School (AECS), Hyderabad.

8. General Services Organisation (GSO), Kalpakkam - GSO is providing services such as maintenance of residential accommodation, medical facilities, educational and transport services to various Units i.e., IGCAR, BARC Facilities, PRP and NPCIL (MAPS) located at Kalpakkam. Housing and medical facilities are also provided to CISF, AECS, Kendriya Vidyalaya staff, etc.

Number of houses allotted and maintained at present by GSO is 4890 at Kalpakkam and 549 at Anupuram. Civil, electrical, air-conditioning and ventilation sections look after the upkeep and maintenance of all buildings and equipments in the townships.

Aided Institutions

9. Tata Institute of Fundamental Research (TIFR), Mumbai - TIFR is primarily an Institute for basic research, but in this process it also develops new technologies and creates a pool of scientific and technical manpower. The research activities of the Institute are organized under : (1) School of Mathematics, (2) School of Natural Sciences, and (3) School of Technology and Computer Science. The School of Natural Sciences has seven departments at Mumbai (Theoretical Physics, Astronomy & Astrophysics, High Energy Physics, Nuclear & Atomic Physics, Condensed Matter Physics & Materials Science, Chemical Sciences and Biological Sciences), and three National Centres : (a) The National Centre for Radio Astrophysics (NCRA) at Pune, with the cylindrical radio-telescope at Ootacamund and Giant Metrewave Length Radio Telescope at Khodab (near Pune) (b) the National Centre for Biological Sciences at Bangalore and (c) the Homi Bhabha Centre for Science Education at Mankhurd, Mumbai .

10. Tata Memorial Centre (TMC), Mumbai - TMC comprises Tata Memorial Hospital (TMH) and Cancer Research Institute (CRI). Tata Memorial Hospital was established in 1941 by Sir Dorabji Tata Trust for the treatment of cancer and allied diseases. It was maintained by funds of the Trust and grants-in-aid received from Government of India and Government of Bombay. To facilitate rapid development and expansion of the facilities for the diagnosis, treatment and research in cancer and other diseases with the help of radioactive isotope and radioactive substances, the administrative control of the Tata Memorial Hospital and the Indian Cancer Research Centre was transferred from the Ministry of Health to the Department of Atomic Energy. TMH is a speciality hospital for services, education & research in cancer. It has the responsibility to set standards of therapy for treatment modalities and a Centre to train doctors, scientists and para-medical staff in the field.

The Advanced Centre for Training Research and Education in Cancer (ACTREC) has become operational and started functioning at Navi Mumbai.

11. Saha Institute of Nuclear Physics (SINP) Kolkata - SINP was established with dual objective of teaching including training for higher researches and conducting research in various aspects on nuclear and bio-physical sciences. Over the past decades SINP has greatly expanded and moved purposefully to effectively play the role expected of it. In addition to pursuing nuclear physics activities, the Institute is presently engaged in research in diverse fields from string theory to protein structure, from Clover detectors to muon Arm Project in ALICE at CERN, from high temperature superconductivity to high intensity magnetic field, from Tokamak plasma to Quark Gluon Plasma, from surface physics to astrophysics and from biology to cosmology.

12. Grants to Other Institutions

12.01 Institute of Physics (IOP), Bhubaneshwar -The Institute promotes fundamental research in the frontier areas of Physics. The branches in which research is carried on are : Solid State Physics, High Energy Physics and Nuclear Physics. On the experimental side the Institute carries on research in Experimental Solid State Physics.

12.02 Harish-Chandra Research Institute (HRI), Allahabad -The Institute is a fully aided Institute of DAE. Its main objective is to conduct fundamental research in various fields of Pure Mathematics, Theoretical Physics and allied topics. Research activities of the Institute have been widely appreciated and recognised by the reputed institutions in the country and abroad.

12.03 Institute of Mathematical Sciences (IMS), Chennai - IMS is an Institution of higher learning whose primary purpose is to foster high quality research in frontier areas of mathematical sciences. The Institute has dynamic programmes for pursuing research in three disciplines : Theoretical Physics, Mathematics and Theoretical Computer Science. The Institute has also hosted several prestigious international and national conferences and small intensive workshops, many of them in emerging areas.

12.04 Institute for Plasma Research (IPR), Gandhinagar - The Institute has a broad charter of objectives to carry out experimental and theoretical research in plasma sciences with emphasis on the physics of magnetically confined plasmas and certain aspects of non-linear phenomena. The Institute also has a mandate to stimulate plasma research and development activities in the Universities and the Industrial sector. It also contributes in the training of plasma physicists and technologists in the country. Since its inception the Institute has pursued these goals in an active manner and made effective contributions. The project Steady State Superconducting Tokamak-1 (SST1) has been completed and put to R&D purpose during the year.

12.05 Grants to Other Institutions - This includes the provisions for Board of Research in Nuclear Sciences (BRNS) and National Board for Higher Mathematics (NBHM), etc.

13. Housing Projects - The provisions include for Housing Schemes for construction of houses for the staff and infrastructural facilities of the Department of Atomic Energy at Mumbai, Kalpakkam, Indore, Kolkata, Hyderabad, etc. Provisions are also made for construction of Housing projects for Aided Institutions like TIFR TMC, etc.

14. Atomic Minerals Directorate for Exploration & Research (AMD) Hyderabad - AMD carries out survey, prospecting and exploration of atomic minerals required for the nuclear power programme of the country. The activities include assessment, analysis, evaluation, characterisation and categorisation of atomic minerals, design and fabrication of radiometric instruments and development of ore extraction flow sheets with the aid of state-of-the-art equipment.

15. Nuclear Fuel Complex (NFC), Hyderabad - NFC is responsible for manufacturing Zirconium alloy clad, natural and enriched Uranium Oxide Fuel Assemblies for all the Pressurised Heavy Water Reactors (PHWRs) and the Boiling Water Reactors (BWRs) respectively in the country. It also manufactures Zirconium Alloy structural components for these reactors including Calandria and Pressure Tubes for PHWRs and Square Channels for BWRs. In addition, NFC produces Seamless Stainless Steel and Special Alloy Tubes of international standards for Nuclear and Non-Nuclear applications and Special and High Purity Materials for strategic use.

16-17 Heavy Water Projects/Production - Heavy Water Board (HWB) was set up in the year 1989 to manage the operation of the Heavy Water Plants (HWPs) of the Department as also to look after the production activities of Heavy Water Plant, Nangal of National Fertilizer Limited.

HWB is operating six HWPs located at Baroda, Tuticorin, Kota, Manuguru, Thal and Hazira with a total designed/de-rated capacity of 500 MT per year. While four HWPs Baroda, Tuticorin, Kota and Manuguru are run departmentally, HWPs at Thal and Hazira are operated and maintained by M/s. RCF & M/s KRIBHCO respectively.

Heavy Water Board has acquired excellence in operation of Heavy Water Plants & embarked upon number of Capital Schemes for reducing specific energy consumption, enhancing safety of the Plants and increasing on stream hours. As a result a cumulative reduction of 24% in specific energy consumption has been achieved during the last 3 years i.e. a saving of Rs.190 crore computed at the unit energy cost of respective years.

HWB also embarked on development and demonstration of new technology for production of heavy water by incorporating Ammonia water front end at HWP (Baroda), which was under shut down due to non-availability of inputs from adjacent fertilizer plant GSFC. Baroda Revival Project (BRP) Phase I&II is expected to be commissioned during 2003-04. HWB also decided to diversify its activities by entering into the field of production of Organophosphorous solvents at HWP (Talcher). A TBP plant is being set up and expected to be commissioned by year-end to meet the requirement of high purity TBP required by BARC.

18. Board of Radiation and Isotope Technology (BRIT), Mumbai - BRIT is responsible for production and supply of radioisotope products, radiation technology equipment and rendering radiation processing services for medical products, spices, etc. The four major areas of applications of radiation technology in which BRIT is actively involved are healthcare, industry, agriculture and supporting research in life sciences and biosciences.

Radiopharmaceutical products and Radio Immuno Assay Kits are being supplied to all nuclear medicine and RIA Centres throughout the country. In addition, BRIT supplies teletherapy sources for treatment of cancer patients. BRIT also supplies kilocurie ⁶⁰Co sources for use in gamma irradiation plants. BRIT products such as ROLI-1 Radiography Camera, Gamma Chamber, Research Irradiator and Blood Irradiator were supplied to various customer institutions.

Many private entrepreneurs have evinced interest in setting up gamma radiation processing facilities for various end purposes and BRIT is collaborating with them and providing facilitation services. BRIT has been regularly imparting training to scientists from various countries under IAEA fellowship in the field of radiopharmaceuticals, radiation processing, radiation sources etc.

19. OTHER PROGRAMMES - This includes the provisions for Management Services group, Thorium Plant, Atomic Energy regulatory Board, international Atomic Energy Agency etc.

20. Grant-in-aid to Electronic Corporation of India Limited (ECIL), Hyderabad - The provision is made for R&D support of ECIL in the form of Grant in-aid.

21. Implementation of VRS in ECIL - Relates to provision made for implementation of VRS, in the ECIL.

22. Investment in Public Enterprises

(i) **Electronics Corporation of India Ltd. (ECIL), Hyderabad** - ECIL was incorporated on 11th April 1967. The main objective of ECIL are to take up development and manufacture of wide range of electronic equipments for Defence, Telecommunications, Atomic Energy Sectors as well as for general industrial applications.

(ii) **Uranium Corporation of India Ltd. (UCIL), Jaduguda** - UCIL was incorporated in 1967 and operates uranium mines at Jaduguda, Bhatin and Narwapahar and Uranium Mill at Jaduguda in Jharkhand. The company also operates a Bye-product Recovery Plant at Jaduguda and Uranium Recovery Plants (from copper tailings) at Rakha and Mosabani, both in Jharkhand.

(iii) **Indian Rare Earths Limited (IREL), Mumbai** - IREL was established in August 1950 mainly for recovering minerals, processing for rare earths compounds and thorium-uranium concentrates. The Company has Rare Earths Plants at Alwaye, and also operates two Mineral Sand Separation Plants at Manavalakurichi in Tamil Nadu and Chavara in Kerala. The company has also set up the Orissa Sand Complex (OSCOM) at Chattrapur in Orissa for processing the beach sand in the Orissa Coast.