

DEPARTMENT OF ATOMIC ENERGY**DEMAND NO. 87****Atomic Energy**

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

		<i>(In crores of Rupees)</i>									
Major Head	Budget 2000-2001			Revised 2000-2001			Budget 2001-2002				
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total		
Revenue	158.40	641.39	799.79	158.48	709.66	868.14	223.93	644.70	868.63		
Capital	501.60	306.57	808.17	441.52	302.68	744.20	575.07	311.35	886.42		
Total	660.00	947.96	1607.96	600.00	1012.34	1612.34	799.00	956.05	1755.05		
1. Secretariat-Economic Services	3451	...	8.98	8.98	...	9.00	9.00	...	9.35	9.35	
	5401	5.75	...	5.75	4.27	...	4.27	2.17	...	2.17	
	<i>Total</i>	5.75	8.98	14.73	4.27	9.00	13.27	2.17	9.35	11.52	
Atomic Energy Research and Industries											
2. Bhabha Atomic Research Centre											
2.01 Research & Development	3401	...	290.24	290.24	...	282.80	282.80	1.00	294.87	295.87	
2.02 Industrial Projects	2852	...	129.76	129.76	...	121.55	121.55	...	130.53	130.53	
2.03 Capital Projects	4861	147.00	...	147.00	127.00	...	127.00	230.00	...	230.00	
	5401	100.00	...	100.00	100.00	...	100.00	110.00	...	110.00	
	<i>Total</i>	247.00	...	247.00	227.00	...	227.00	340.00	...	340.00	
Total - BARC		247.00	420.00	667.00	227.00	404.35	631.35	341.00	425.40	766.40	
3. Indira Gandhi Centre for Atomic Research Kalpakkam											
3.01 Operation of Fast Breeder Test Reactor & Other Facilities	3401	4.00	62.00	66.00	5.00	61.00	66.00	5.00	63.47	68.47	
3.02 FBTR Fuel Reprocessing	4861	15.00	...	15.00	9.26	...	9.26	12.00	...	12.00	
3.03 Capital Projects	5401	46.00	...	46.00	48.15	...	48.15	51.00	...	51.00	
Total - IGCAR		65.00	62.00	127.00	62.41	61.00	123.41	68.00	63.47	131.47	
4. Centre for Advanced Technology, Indore	3401	5.30	21.00	26.30	4.90	21.25	26.15	5.50	22.09	27.59	
	4861	1.00	-0.50	0.50	1.00	-0.50	0.50	1.00	-0.50	0.50	
	5401	32.20	...	32.20	39.33	...	39.33	48.77	...	48.77	
Total - CAT		38.50	20.50	59.00	45.23	20.75	65.98	55.27	21.59	76.86	
5. Variable Energy Cyclotron Centre, Kolkata	3401	0.50	15.93	16.43	0.97	16.10	17.07	0.42	16.40	16.82	
	5401	19.00	...	19.00	21.64	...	21.64	23.58	...	23.58	
	<i>Total</i>	19.50	15.93	35.43	22.61	16.10	38.71	24.00	16.40	40.40	
6. Purchase & Stores Organisation, Mumbai	3401	...	11.49	11.49	...	10.48	10.48	...	10.59	10.59	
7. Construction & Services Group, Mumbai	3401	0.50	33.50	34.00	0.50	34.86	35.36	0.43	35.14	35.57	
8. General Services Organisation, Kalpakkam	3401	...	15.47	15.47	...	16.57	16.57	...	17.20	17.20	
9. Tata Institute of Fundamental Research, Mumbai	3401	24.00	61.00	85.00	24.00	64.20	88.20	30.00	65.57	95.57	
10. Tata Memorial Centre, Mumbai	3401	19.20	43.50	62.70	19.20	46.93	66.13	27.00	48.63	75.63	
11. Saha Institute of Nuclear Physics, Kolkata	3401	10.50	15.00	25.50	10.50	15.40	25.90	8.00	14.60	22.60	
11.1 Investment in Share Capital (GIA)	2852	1.80	...	1.80	0.01	...	0.01	1.00	...	1.00	
12. Grant to other Institutions.											
12.01 Institute of Physics, Bhubneswar	3401	3.00	4.54	7.54	3.25	4.72	7.97	4.15	4.90	9.05	
12.02 Mehta Research Institute of Mathematics and Mathematical Physics, Allahabad	3401	3.60	4.00	7.60	3.60	4.30	7.90	2.13	4.86	6.99	
12.03 Institute of Mathematical Sciences Chennai	3401	3.00	5.25	8.25	3.55	5.30	8.85	3.50	5.75	9.25	
12.04 Institute of Plasma Research, Gandhinagar	3401	50.00	6.00	56.00	50.00	6.00	56.00	60.00	6.48	66.48	
12.05 Grants to other Institutions	3401	24.50	...	24.50	24.50	...	24.50	29.82	...	29.82	
	<i>Total</i>	84.10	19.79	103.89	84.90	20.32	105.22	99.60	21.99	121.59	

(In crores of Rupees)											
	Major Head	Budget , 2000-2001			Revised, 2000-2001			Budget, 2001-2002			
		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
13. Housing Projects (Capital)	5401	59.70	...	59.70	41.93	...	41.93	33.75	...	33.75	
14. Atomic Minerals Division	3401	...	42.42	42.42	...	42.30	42.30	...	44.09	44.09	
	4861	3.90	...	3.90	4.40	...	4.40	5.00	...	5.00	
	5401	7.25	...	7.25	6.67	...	6.67	8.95	...	8.95	
	<i>Total</i>	<i>11.15</i>	<i>42.42</i>	<i>53.57</i>	<i>11.07</i>	<i>42.30</i>	<i>53.37</i>	<i>13.95</i>	<i>44.09</i>	<i>58.04</i>	
Nuclear Fuel											
15. Nuclear Fuel Complex, Hyderabad											
15.01 Fuel Fabrication Facilities:											
	Gross	2852	...	430.80	430.80	...	429.00	429.00	...	437.92	437.92
	Less-Receipts	0852	...	-631.55	-631.55	...	-659.31	-659.31	...	-659.63	-659.63
	Net	-200.75	-200.75	...	-230.31	-230.31	...	-221.71	-221.71
	15.02 Common Services	2852	...	7.73	7.73	...	7.72	7.72	...	7.88	7.88
	15.03 Steel Tubes Plant	2852	...	15.00	15.00	...	14.68	14.68	...	15.30	15.30
	15.04 Capital Projects of NFC	4861	20.00	...	20.00	9.40	...	9.40	12.00	...	12.00
Total-Nuclear Fuel Complex		20.00	-178.02	-158.02	9.40	-207.91	-198.51	12.00	-198.53	-186.53	
Heavy Water											
16. Heavy Water Projects											
	16.01 Maintenance of Housing Colonies for Heavy Water Plants	2852	...	4.98	4.98	...	4.88	4.88	...	5.23	5.23
	16.02 Other Heavy Water Plants	4861	12.28	3.50	15.78	9.13	4.63	13.76	21.00	4.73	25.73
Total-Heavy Water Projects		12.28	8.48	20.76	9.13	9.51	18.64	21.00	9.96	30.96	
17. Heavy Water Production											
	17.01 Heavy Water Plant, Baroda	4861	...	13.23	13.23	...	10.73	10.73	...	15.02	15.02
	17.02 Heavy Water Plant, Kota	4861	...	76.26	76.26	...	68.11	68.11	...	67.67	67.67
	17.03 Heavy Water Plant, Tuticorin	4861	...	50.65	50.65	...	46.06	46.06	...	56.07	56.07
	17.04 Heavy Water Plant, Talcher	4861	...	5.60	5.60	...	5.33	5.33	...	6.04	6.04
	17.05 Heavy Water Plant, Thal	4861	...	76.54	76.54	...	82.53	82.53	...	78.68	78.68
	17.06 Heavy Water Plant, Hazira	4861	...	98.51	98.51	...	93.05	93.05	...	91.78	91.78
	17.07 Heavy Water Plant, Manuguru	4861	...	141.68	141.68	...	129.24	129.24	...	136.56	136.56
	<i>Total</i>	<i>462.47</i>	<i>462.47</i>	...	<i>435.05</i>	<i>435.05</i>	...	<i>451.82</i>	<i>451.82</i>
	Less- Loss of Heavy Water	4861	...	-161.29	-161.29	...	-138.89	-138.89	...	-167.21	-167.21
	Net	301.18	301.18	...	296.16	296.16	...	284.61	284.61
Total - Heavy Water		12.28	309.66	321.94	9.13	305.67	314.80	21.00	294.57	315.57	
18. Board for Radiation and Isotope Technology, Mumbai											
	2852	...	25.00	25.00	...	24.85	24.85	...	25.93	25.93	
	4861	18.00	...	18.00	10.11	...	10.11	8.50	...	8.50	
	<i>Total</i>	<i>18.00</i>	<i>25.00</i>	<i>43.00</i>	<i>10.11</i>	<i>24.85</i>	<i>34.96</i>	<i>8.50</i>	<i>25.93</i>	<i>34.43</i>	
19. Other Programmes											
	2852	...	10.20	10.20	...	10.20	10.20	...	7.96	7.96	
	3401	1.00	9.15	10.15	1.00	9.30	10.30	1.00	9.58	10.58	
	4425	...	...	...	...	...	...	...	...	...
	4861	3.50	2.39	5.89	1.90	2.39	4.29	1.00	2.50	3.50	
	5401	1.00	...	1.00	2.31	...	2.31	2.83	...	2.83	
	<i>Total</i>	<i>5.50</i>	<i>21.74</i>	<i>27.24</i>	<i>5.21</i>	<i>21.89</i>	<i>27.10</i>	<i>4.83</i>	<i>20.04</i>	<i>24.87</i>	
20. Grants-in-aid to Electronic Corporation of India Limited											
21. Investments in Public Enterprises											
	i. Electronics Corporation of India Ltd.	4859	0.01	...	0.01	...	0.01	0.01	...	0.01	
		6859	0.01	...	0.01	...	0.01	0.01	20.01	20.02	
	<i>Total</i>	<i>0.02</i>	...	<i>0.02</i>	<i>0.02</i>	...	<i>0.02</i>	<i>0.02</i>	<i>20.01</i>	<i>20.03</i>	
	ii. Uranium Corporation of India Ltd.	4861	5.00	...	5.00	...	5.00	3.00	...	3.00	
	iii. Indian Rare Earths Ltd.	4861	5.00	...	5.00	...	...	0.50	...	0.50
	Total	10.02	...	10.02	5.02	...	5.02	3.52	20.01	23.53	
Total-Atomic Energy Research and Industries		654.25	938.98	1593.23	595.73	1003.34	1599.07	796.83	946.70	1743.53	
Grand Total		660.00	947.96	1607.96	600.00	1012.34	1612.34	799.00	956.05	1755.05	

(In crores of Rupees)

B. Investment in Public Enterprises	Head of Dev.	Budget, 2000-2001			Revised, 2000-2001			Budget, 2001-2002		
		Budget Support	IEBR	Total	Budget Support	IEBR	Total	Budget Support	IEBR	Total
1. Electronics Corporation of India Ltd.	12859	0.02	...	0.02	0.02	...	0.02	20.03	...	20.03
2. Uranium Corporation of India Ltd.	12861	5.00	...	5.00	5.00	...	5.00	3.00	2.00	5.00
3. Indian Rare Earths Ltd.	12861	5.00	55.06	60.06	...	22.00	22.00	0.50	24.50	25.00
Total		10.02	55.06	65.08	5.02	22.00	27.02	23.53	26.50	50.03
C. Plan Outlay										
1. Telecommunication and Electronics Industries	12859	0.02	...	0.02	0.02	...	0.02	0.02	...	0.02
2. Atomic Energy Industries	12861	239.98	55.06	295.04	184.71	22.00	206.71	339.98	26.50	366.48
3. Atomic Energy Research	13401	420.00	...	420.00	415.27	...	415.27	459.00	...	459.00
Total		660.00	55.06	715.06	600.00	22.00	622.00	799.00	26.50	825.50

1. Secretariat – Economic Services: This provision includes the DAE Secretariat and Atomic Energy Commission.

2. Bhabha Atomic Research Centre (BARC), Mumbai: BARC's R&D efforts are concentrated towards fulfilling its mandate of indigenous nuclear programme and other peaceful uses of Nuclear Energy. The technology to design, build and operate nuclear power reactors has been mastered and a blue print is being made ready for the development of next generation of nuclear reactors for exploiting vast reserves of Thorium. Considerable self reliance has been achieved in the field of nuclear materials which go into the making of a reactor and fuels which run it. An indigenous capability has been built over the years to reprocess the spent fuel and recycle the valuable fertile and fissile material and to manage the nuclear wastes by isolating it from environment to minimize the risks for future generations. BARC has contributed significantly by supplying radioisotopes, which find extensive use in the fields of agriculture, medicine and industries. Ensuring health and safety of personnel against radiation and protection of environment has been the primary concern in all its endeavours. The Centre also aims to provide R&D support for Nuclear power generation programme.

Research reactors DHRUVA and APSARA are operating well. The refurbishing of CIRUS Research Reactor is in full swing to extend the useful life of the reactor and a desalination plant is also planned to be coupled with this reactor. The design and engineering development of Advanced Heavy Water Reactor (AHWR) is progressing well.

A major milestone was achieved in the radioactive waste management programme with the inauguration of the country's first Solid Storage Surveillance Facility (S3F) at Tarapur. India has thus become the fourth nation in the world to have such a hi-tech facility. This is an important step prior to disposal of higher level wastes in deep geological repository.

BARC regularly makes available processes/technologies developed for in-house use 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 is a multidisciplinary research Unit of DAE, primarily engaged in the design and development of Sodium Cooled Fast Breeder Reactors (FBR) in the country to meet the long term power needs. The Centre has established comprehensive R&D facilities covering the entire range of FBR technology, including the closing of fuel cycles and has a strong base in wide range of disciplines related to this advanced technology.

4. Centre for Advanced Technology (CAT), Indore: CAT was established to undertake major R&D projects in the areas of accelerators, lasers and related fields. During the last two plan periods, the Centre has established a number of R&D laboratories and an excellent infrastructure including workshops, computer centre and library. The most important project undertaken by CAT was the development of India's first SRS INDUS-1. INDUS-1 consists of three accelerators namely 20 MeV microtron, 450 MeV synchrotron and 450 MeV storage ring. All the three have successfully developed and commissioned at 450 MeV at INDUS-1 which far exceeds the design current of 100 mA.

5. Variable Energy Cyclotron Centre (VECC), Kolkata: VECC is a research and development Unit under the Department of Atomic Energy. After building the country's largest and the first indigenous cyclotron, it has been operating the machine to provide proton, deuteron and alpha particle beams of various energies. The Centre has been carrying out research in basic and applied sciences, development of the Accelerator technology and building new accelerator. Besides, the Centre has been participating in the International Collaboration promoting the facilities of nuclear Diagnostics as part of the DAE's commitment for health, R&D exploration for Helium from hot springs etc.

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 and Estate Management (DCS&EM), Mumbai : DCS&EM is responsible for construction and allotment of residential flats to the employees of the constituent Units including PSUs based at Mumbai, in addition to providing infrastructural facilities to the School etc. In addition, the construction of the office/laboratory buildings and infrastructural facilities is also undertaken for other Units of the Department within Mumbai and outside.

8. General Services Organisation (GSO), Kalpakkam: GSO is providing various services like residential accommodation, Medical Facilities, School and Transport facilities, etc. to all the Units of DAE located at Kalpakkam, such as IGCAR, BARC Facilities, MAPS, etc.

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 three Schools : (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 & Material 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 the Giant Meterwave length Radio Telescope (GMRT) at Khodad (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 the Tata Memorial Hospital (TMH) and Cancer Research Institute (CRI). The Tata Memorial Hospital was established in 1941 by Sir Dorabji Tata Trust for the treatment and cure of Cancer and allied diseases and was maintained by funds of the Trust and Grants-in-aid received from Government of India and then 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. The Tata Memorial Centre is now is a fully aided Institution under the administrative control of the Department of Atomic Energy. The 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.

11. Saha Institute of Nuclear Physics (SINP), Kolkata: SINP was established with a 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 as one of the premier Nuclear Research Institutions of the country by diversifying its research activities and academic coverage. From a very humble beginning, around a small cyclotron indigenously fabricated, the Institute has now grown to a substantial size and has earned national and international recognition.

12. Grants to Other Institutions:

12.01 Institute of Physics (IOP), Bhubaneswar: 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 Mehta Research Institute of Mathematics and Mathematical Physics (HRI), Allahabad: The Institute is an aided institute of the Department. Its main aim is to conduct fundamental research in various fields of Pure Mathematics, Theoretical Physics and allied topics. The Institute takes all steps necessary for furtherance of its objectives, as aforesaid. Research activities of the Institute have been widely appreciated and recognised by the reputed institutions in the country abroad.

12.03 Institute of Mathematical Sciences (IMS), Chennai: The Institute of Mathematical Sciences 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 is 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.

12.05 Grants to other Institutions: This includes the provisions relating to National Board for Higher Mathematics, Board of Research in Nuclear Sciences, Dr. Barooah Cancer Institute at Gauhati (Assam), etc.

13. Housing Projects: The provisions include for housing projects for staff of the Department at Mumbai, Kalpakkam, Indore, Calcutta, Hyderabad, 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, characterization and categorization 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 and Zirconium Alloy structural components for these reactors, including Calandria and Pressure Tubes for PHWRs and Square Channels for BWRs.

16 & 17. Heavy Water Projects/Production: Heavy Water Board (HWB) was set up in the year 1989 to over-see the operation of the Heavy Water Plants (HWP) of the Department as also to look after the production activities of Heavy Water Plant, Nangal of National Fertilizer Limited, from whom Heavy Water is being purchased. HWB is operating six HWPs located at Baroda, Tuticorin, Kota, Manuguru, Thal and Hazira with a total designed/derated capacity of 500 MT per year. While four HWPs at Baroda, Tuticorin, Kota and Manuguru are run departmentally, HWPs at Thal and Hazira are operated and maintained by M/s RCF and M/s KRIBHCO respectively.

18. Board of Radiation & Isotope Technology (BRIT), Mumbai: BRIT is responsible for production and supply of variety of radioisotope products including radiochemicals, radiation sources, radiopharmaceuticals, carbon-14 and tritium labeled compounds, labeled biomolecules, gamma radiography equipment and irradiators to various users for application in Health care, Industry, Agriculture and Research.

19. Other programmes: This includes the provisions for Management Services Group, Thorium Plant, Atomic Energy Regulatory Board, International Atomic Energy Agency, etc.

20. Grants-in-aid to Electronics Corporation of India Limited (ECIL), Hyderabad: This provision includes Voluntary Retirement Scheme for ECIL (Rs.40 crore) and write-off of loans, outstanding interests, etc .

21. Investments in Public Enterprises

- (i) **Electronics Corporation of India Limited (ECIL), Hyderabad:** ECIL was incorporated on 11th April, 1967. The main objects 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 Limited (UCIL), Jaduguda:** UCIL was incorporated in 1967 and operates uranium mines at Jaduguda, Bhatin and Narwapahar and Uranium Mill at Jaduguda in Bihar. The company also operates a Bye-products Recovery Plant at Jaduguda and Uranium Recovery Plants (from copper tailings) at Rakha and Mosabani, both in Bihar.

- (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 the Thorium Plant at Trombay, Mumbai. The company has also set up the Orissa Sand Complex (OSCOM) at Chatrapur in Orissa for processing the beach sand in the Orissa Coast.