

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

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

		Budget 2004-2005			Revised 2004-2005			Budget 2005-2006		
Major Head		Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total
Revenue		231.10	960.79	1191.89	213.70	992.35	1206.05	237.80	992.61	1230.41
Capital		1023.28	289.21	1312.49	736.30	392.65	1128.95	1249.63	415.39	1665.02
Total		1254.38	1250.00	2504.38	950.00	1385.00	2335.00	1487.43	1408.00	2895.43
1.	Secretariat-Economic Services	3451	...	12.20	12.20	...	12.53	12.53	...	12.09
		5401	0.85	...	0.85	0.40	...	0.40	...	...
	<i>Total</i>		<i>0.85</i>	<i>12.20</i>	<i>13.05</i>	<i>0.40</i>	<i>12.53</i>	<i>12.93</i>	...	<i>12.09</i>
2.	Atomic Energy Regulatory Board	3401	...	...	...	...	...	1.00	8.41	9.41
		5401	...	...	...	...	...	6.05	...	6.05
	<i>Total</i>		...	...	...	...	...	<i>7.05</i>	<i>8.41</i>	<i>15.46</i>
Atomic Energy Research and Industries										
3.	Bhabha Atomic Research Centre, Mumbai	2852	...	145.80	145.80	...	152.00	152.00	...	161.85
		3401	...	368.00	368.00	...	364.00	364.00	...	369.23
		4861	190.00	...	190.00	120.00	...	120.00	188.00	...
		5401	250.00	...	250.00	195.00	...	195.00	360.00	...
	Total - BARC		440.00	513.80	953.80	315.00	516.00	831.00	548.00	531.08
4.	Indira Gandhi Centre for Atomic Research, Kalpakkam	3401	...	89.60	89.60	...	90.90	90.90	...	90.70
		4861	20.00	...	20.00	20.00	...	20.00	48.00	...
		5401	54.00	...	54.00	50.00	...	50.00	73.65	...
	Total - IGCAR		74.00	89.60	163.60	70.00	90.90	160.90	121.65	90.70
5.	Centre for Advanced Technology, Indore	3401	...	34.60	34.60	...	36.65	36.65	...	40.40
		4861	...	...	...	...	...	...	...	...
		5401	66.00	...	66.00	66.00	...	66.00	76.50	...
	Total - CAT		66.00	34.60	100.60	66.00	36.65	102.65	76.50	40.40
6.	Variable Energy Cyclotron Centre, Kolkata.	3401	...	21.10	21.10	...	22.95	22.95	...	22.80
		5401	54.48	...	54.48	25.00	...	25.00	60.00	...
	<i>Total</i>		<i>54.48</i>	<i>21.10</i>	<i>75.58</i>	<i>25.00</i>	<i>22.95</i>	<i>47.95</i>	<i>60.00</i>	<i>22.80</i>
7.	Directorate of Purchase & Stores, Mumbai	3401	...	12.71	12.71	...	14.29	14.29	...	14.30
8.	General Services Organisation, Kalpakkam	3401	...	25.85	25.85	...	29.29	29.29	...	25.38
9.	<i>Autonomous Bodies</i>									
9.1	Tata Institute of Fundamental Research, Mumbai	3401	51.00	79.50	130.50	56.25	79.10	135.35	57.32	80.14
9.2	Tata Memorial Centre, Mumbai	3401	37.00	65.75	102.75	26.00	56.25	82.25	33.00	67.30
9.3	Saha Institute of Nuclear Physics, Kolkata	3401	27.50	19.25	46.75	26.00	19.80	45.80	20.90	20.45
9.4	Institute of Physics, Bhubneswar	3401	4.00	8.15	12.15	3.55	6.70	10.25	4.90	7.70
9.5	Harish Chandra Research Institute Allahabad	3401	2.90	7.35	10.25	1.75	7.45	9.20	2.90	7.52
9.6	Institute of Mathematical Sciences, Chennai.	3401	1.10	8.40	9.50	0.65	8.45	9.10	1.80	8.70
9.7	Institute for Plasma Research, Gandhinagar	3401	42.00	27.00	69.00	41.00	35.50	76.50	50.00	43.70
9.8	Atomic Energy Education Society, Mumbai	3401	...	...	...	...	...	...	7.85	14.62
	Total - Autonomous Bodies		165.50	215.40	380.90	155.20	213.25	368.45	178.67	250.13
10.	Assistance to Universities, etc. (Grants to Other Institutions)	3401	51.30	...	51.30	45.00	...	45.00	52.63	...
11.	Directorate of Construction, Services and Estate Management	3401	8.30	49.90	58.20	4.15	46.97	51.12	...	33.60

(In crores of Rupees)

Major Head	Budget 2004-2005			Revised 2004-2005			Budget 2005-2006			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
(DCS&EM), Mumbai										
12. Housing Projects	5401	35.54	...	35.54	10.00	...	10.00	25.00	...	25.00
12.1 Projects under DCS&EM	5401	...	...	...	18.20	...	18.20	22.46	...	22.46
12.2 Other Housing Projects		35.54	...	35.54	28.20	...	28.20	47.46	...	47.46
Total - Housing Projects	3401	...	50.85	50.85	...	53.20	53.20	...	53.58	53.58
13. Atomic Minerals Directorate for	4861	11.40	...	11.40	11.40	...	11.40	9.65	...	9.65
Exploration and Research,	5401	15.00	...	15.00	18.80	...	18.80	16.35	...	16.35
Hyderabad	<i>Total</i>	<i>26.40</i>	<i>50.85</i>	<i>77.25</i>	<i>30.20</i>	<i>53.20</i>	<i>83.40</i>	<i>26.00</i>	<i>53.58</i>	<i>79.58</i>
Nuclear Fuel										
14. Nuclear Fuel Complex,										
Hyderabad										
14.01 Fuel Fabrication Facilities:	2852	...	456.61	456.61	...	412.96	412.96	...	422.55	422.55
Gross	0852	...	-601.05	-601.05	...	-536.87	-536.87	...	-584.12	-584.12
Less-Receipts		...	-144.44	-144.44	...	-123.91	-123.91	...	-161.57	-161.57
Net	2852	...	13.90	13.90	...	15.62	15.62	...	14.44	14.44
14.02 Common Facilities	2852	...	13.49	13.49	...	14.79	14.79	...	15.23	15.23
14.03 Stainless Steel Tubes	4861	64.00	...	64.00	25.00	...	25.00	144.50	...	144.50
Plant		64.00	-117.05	-53.05	25.00	-93.50	-68.50	144.50	-131.90	12.60
14.04 Capital Outlay on NFC										
Total-Nuclear Fuel Complex										
Heavy Water										
15. Heavy Water Board										
15.01 Maintenance of Housing	2852	...	8.00	8.00	...	8.63	8.63	...	8.42	8.42
Colonies for Heavy Water										
Plants	4861	23.00	6.68	29.68	18.30	6.90	25.20	40.00	6.95	46.95
15.02 Central Office (Other		23.00	14.68	37.68	18.30	15.53	33.83	40.00	15.37	55.37
Heavy Water Plants)										
Total-Heavy Water Projects										
16. Heavy Water Production	4861	...	43.87	43.87	...	42.05	42.05	...	40.59	40.59
16.01 Heavy Water Plant,	4861	...	93.35	93.35	...	90.91	90.91	...	89.67	89.67
Baroda										
16.02 Heavy Water Plant, Kota	4861	...	55.50	55.50	...	57.08	57.08	...	59.25	59.25
16.03 Heavy Water Plant,	4861	...	7.59	7.59	...	7.13	7.13	...	7.80	7.80
Tuticorin	4861	...	70.38	70.38	...	68.85	68.85	...	70.72	70.72
16.04 Heavy Water Plant,	4861	...	96.18	96.18	...	95.01	95.01	...	90.86	90.86
Talcher										
16.05 Heavy Water Plant, Thal	4861	...	133.49	133.49	...	131.68	131.68	...	129.68	129.68
16.06 Heavy Water Plant, Hazira	<i>Total</i>	...	<i>500.36</i>	<i>500.36</i>	...	<i>492.71</i>	<i>492.71</i>	...	<i>488.57</i>	<i>488.57</i>
16.07 Heavy Water Plant,	4861	...	-217.83	-217.83	...	-106.96	-106.96	...	-80.13	-80.13
Manuguru		...	<i>282.53</i>	<i>282.53</i>	...	<i>385.75</i>	<i>385.75</i>	...	<i>408.44</i>	<i>408.44</i>
Less- Loss of Heavy Water		23.00	297.21	320.21	18.30	401.28	419.58	40.00	423.81	463.81
Net	4861	...	...	...	...	...	...	...	627.24	627.24
	4861	...	...	...	...	...	...	...	-627.24	-627.24
Total - Heavy Water										
17. Feed Stock										
Less- Heavy Water Production	2852	...	25.70	25.70	...	24.00	24.00	...	24.91	24.91
Total - Feed Stock	4861	17.06	...	17.06	6.59	...	6.59	15.64	...	15.64
18. Board for Radiation and Isotope	<i>Total</i>	<i>17.06</i>	<i>25.70</i>	<i>42.76</i>	<i>6.59</i>	<i>24.00</i>	<i>30.59</i>	<i>15.64</i>	<i>24.91</i>	<i>40.55</i>
Technology, Mumbai	2852	...	2.28	2.28	...	0.27	0.27	...	...	...
	3401	1.00	15.85	16.85	0.70	16.92	17.62	...	...	...
	4861	41.34	...	41.34	1.69	...	1.69	...	...	...
19. Other Programmes	5401	1.61	...	1.61	1.72	...	1.72	...	...	...
	<i>Total</i>	<i>43.95</i>	<i>18.13</i>	<i>62.08</i>	<i>4.11</i>	<i>17.19</i>	<i>21.30</i>	...	...	...
	2852	...	...	...	...	...	...	...	0.25	0.25
19.01 Management	3401	...	...	...	...	...	...	...	4.42	4.42
Services Group	<i>Total</i>	...	...	...	...	...	...	...	4.67	4.67
19.02 International Atomic		43.95	18.13	62.08	4.11	17.19	21.30	...	4.67	4.67
Energy Agency										
	3401	...	...	...	...	...	...	...	4.04	4.04
Total - Other Programmes	5401	...	...	...	...	...	...	0.43	...	0.43
20. DAE Projects	<i>Total</i>	...	...	...	...	...	...	<i>0.43</i>	<i>4.04</i>	<i>4.47</i>
20.01 R & D Projects	4861	...	...	...	...	...	...	25.30	...	25.30
		...	...	...	...	...	...	25.73	4.04	29.77

(In crores of Rupees)										
Major Head	Budget 2004-2005			Revised 2004-2005			Budget 2005-2006			
	Plan	Non-Plan	Total	Plan	Non-Plan	Total	Plan	Non-Plan	Total	
20.02 I & M Projects										
Total - DAE Projects										
21. Grants-in-aid to Electronics Corporation of India Limited	2852	5.00	...	5.00	8.65	...	8.65	5.50	...	5.50
22. Investments in Public Enterprises	4859	9.00	...	9.00	9.00	...	9.00	9.00	...	9.00
22.01 Electronics Corporation of India Ltd.	4861	160.00	...	160.00	135.50	...	135.50	119.10	...	119.10
22.02 Uranium Corporation of India Ltd.	4861	10.00	...	10.00	3.70	...	3.70	10.00	...	10.00
22.03 Indian Rare Earths Ltd.		179.00	...	179.00	148.20	...	148.20	138.10	...	138.10
Total-Investment in Public Enterprises		1253.53	1237.80	2491.33	949.60	1372.47	2322.07	1480.38	1387.50	2867.88
Total-Atomic Energy Research and Industries		1254.38	1250.00	2504.38	950.00	1385.00	2335.00	1487.43	1408.00	2895.43
Grand Total										
B. Investment in Public Enterprises	Head of Dev.	Budget, 2004-2005		Total	Revised, 2004-2005		Total	Budget, 2005-2006		Total
		Budget Support	IEBR		Budget Support	IEBR		Budget Support	IEBR	
1. Electronics Corporation of India Ltd.	12859	9.00	25.00	34.00	9.00	25.00	34.00	9.00	25.00	34.00
2. Uranium Corporation of India Ltd.	12861	160.00	94.00	254.00	135.50	94.00	229.50	119.10	161.50	280.60
3. Indian Rare Earths Ltd	12861	10.00	52.74	62.74	3.70	41.05	44.75	10.00	75.10	85.10
Total		179.00	171.74	350.74	148.20	160.05	308.25	138.10	261.60	399.70
C. Plan Outlay	12859	9.00	25.00	34.00	9.00	25.00	34.00	9.00	25.00	34.00
1. Telecommunication and Electronics Industries	12861	541.80	146.74	688.54	350.83	135.05	485.88	605.69	236.60	842.29
2. Atomic Energy Industries	13401	703.58	...	703.58	590.17	...	590.17	872.74	...	872.74
3. Atomic Energy Research		1254.38	171.74	1426.12	950.00	160.05	1110.05	1487.43	261.60	1749.03

Total¹. 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, five PSU's, three Service Organizations and eight aided institutions. There is a Branch Secretariat at New Delhi.

2. Atomic Energy Regulatory Board, (AERB) Mumbai- AERB enforces radiological safety stipulations and is assisted by Safety Review Committee for Operating Plants (SARCOP), Safety Review Committee (SRC) for applications for radiation and other committees in carrying out its mandate in prescribing radiological, nuclear and industrial safety regulations.

ATOMIC ENERGY RESEARCH & INDUSTRIES

3. Bhabha Atomic Research Centre (BARC), Mumbai - BARC is a multi-disciplinary organisation, pursuing comprehensive research and development programmes for harnessing nuclear energy and its application for advancement of the society. These efforts are concentrated in the fields of nuclear sciences, engineering & technology, basic sciences and allied fields. The activities are geared for exploitation of atomic energy for power generation and development of radiation technology and its application in the areas of agriculture, medicine, industry and research. For fulfilling the mandate, interaction with academic institutions and international co-operation in related advanced areas of research are being strengthened. BARC continues to provide required support to ensure national security.

There were significant activities and achievements of the research centre during the last one-year. An extensive rehabilitation programme for coolant channels of RAPS-I has been carried out as a result of which the operating life of coolant channels has been increased. To provide a low cost alternative teletherapy unit for the expensive teletherapy unit being imported, the first indigenous development of cobalt-60 Teletherapy Machine has been completed and the machine has been installed at ACTREC, Navi Mumbai and testing is in progress. A digital medical imaging system based on a Charge Coupled Device (CCD) has been developed for the first time in the country along with a variety of image processing software.

BARC's Nisargruna (biogas) plants are a boon to solid waste management authorities. Two Nisargruna plants of 5 tones/day capacity each have started operating at Shatabdi Hospital, Govandi and Deonar abattoir respectively.

In an effort to develop Teraflop parallel Super-computers, BARC has achieved a very significant milestone by commissioning an ANUPAM-ARUNA parallel supercomputer with 128 processors, giving a computational speed of 360 Gigaflops. MAT Lab has been established for the first time in India for the preparation of ultra pure metals like gallium, arsenic, etc. and their organo-metallics with purity >6N. An advanced vitrification system for immobilising radioactive waste is in advanced stage of completion.

4. Indira Gandhi Centre for Atomic Research (IGCAR), Kalpakkam - IGCAR is a multi-disciplinary Research & Development Unit established in 1971, with the focused mission of indigenous design and development of liquid sodium cooled Fast Breeder Reactor (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 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.

5. Centre for Advanced Technology (CAT), Indore- CAT was established in 1987. 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. The 2.5 GeV SRS Indus-II is in advanced stages of completion.

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. A radiotherapy machine, 10 MeV variable energy microtone, is expected to be commissioned by end of this financial year.

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 is developing a 20 KW CO₂ laser, which will be used for cutting, welding and cladding applications. Under the programme to develop semi conductor diode solid state lasers, CAT has obtained 40 W of output power from such lasers in the infrared and more than 10 W in the green. A small such laser capable of giving 2 W in the green is being developed for ophthalmic applications. A laser level reference system which will allow land leveling to within a few centimeters over more than 100 meter radius has been developed at CAT.

6. Variable Energy Cyclotron Centre (VECC), Kolkata VECC has been operating the nation's largest and the first indigenously built cyclotron 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 construction of K500 superconducting cyclotron and Radioactive Ion Beam (RIB) Facility have been undertaken. In respect of K500

superconducting cyclotron, the cool down process has started and the magnet is expected to be energised shortly. In respect of RIB full scale RFQ fabrication is expected to be completed shortly. Using heavy ion source with room temperature cyclotron it has been possible to accelerate alpha and proton beams which will be used for testing the RIB systems.

In tune with 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. Recently an Iodine - 131-therapy unit for cancer thyroid patients has been added.

7. Directorate of Purchase & Stores (DPS), Mumbai - The objective of DPS is to ensure availability of quality materials at right time and at right place. In the process, DPS also ensures that the materials are procured at right price. Number of materials required by the R&D Units of the Department are of developmental nature. DPS is also entrusted with the work of locating the right sources of supply for manufacture of various complicated precision equipment.

DPS is responsible for safe transportation, receipt, accounting, proper storing, safe custody and timely issue of materials to the project authorities. It is also entrusted with indenting, procurement, stocking, issue and accounting of common user items. Besides, it is also responsible for collection, storing and disposal of scrap, and redistribution of surplus materials to the needy Units. DPS is carrying out the functions of Materials Management relating to the Department.

8. General Services Organisation (GSO), Kalpakkam- GSO is providing services such as residential accommodation, health services under CHSS, transport services, educational facilities, etc. It is also responsible for the maintenance of buildings, roads within the colony, maintenance of water supply, etc. to all DAE Units located at Kalpakkam.

9. AUTONOMOUS BODIES

9.01. 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. TIFR has also been conferred the status of Deemed University by the University Grants Commission from June 2002.

The School of Natural Sciences has seven departments at Mumbai (Theoretical Physics, Astronomy & Astrophysics, High Energy Physics, Nuclear and 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 Khodad (near Pune) (b) National Centre for Biological Sciences at Bangalore and (c) Homi Bhabha Centre for Science Education at Mankhurd, Mumbai. The School has also set up several field stations for various research facilities at Hyderabad, Ootacamund (Tamil Nadu), Pachmarhi (MP) and Gauribidnur (Karnataka).

9.02. Tata Memorial Centre (TMC) Mumbai -TMC comprises Tata Memorial Hospital (TMH) at Mumbai and

Advanced Centre for Treatment, Research, and Education in Cancer (ACTREC) at Navi Mumbai. TMH 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 Govt. of India and the then Govt. of Bombay.

To facilitate rapid development and expansion of the facilities for the diagnosis, treatment and research in cancer and other allied diseases with the help of radioactive isotope and radioactive substances, the administrative control of TMH and Indian Cancer Research Centre was transferred from the Ministry of Health to the Dept. 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.

Cancer Research Institute (CRI) established in 1952, is one of the units of Tata Memorial Centre and conducts basic, community-based and clinically oriented research on multiple facets of cancer, focusing on the cancers prevalent in India. These include cancers of oral cavity, cervix, leukaemia and lymphomas and tobacco related cancers.

The first indigenous Teletherapy Machine for cancer treatment was developed by BARC and installed at ACTREC. It is a state-of-the-art machine, which incorporates world class features. The cost of indigenous machine is significantly less than imported machine of similar capacity. With this development, small hospitals in rural areas can afford teletherapy machine for cancer treatment.

9.03 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.

9.04. Institute of Physics (IOP) Bhubaneswar - IOP is engaged in research and development activities in the frontier areas of physics and allied sciences. The theoretical research at the Institute covers the areas of high energy physics, quantum computing and mathematical physics, nuclear physics, condensed matter physics, bio-physics, astrophysics etc. The Institute made significant contributions in these areas. During this year, many experimental facilities were established at the Institute giving further fillip to the research in surface and nanomaterial sciences. The Accelerator Mass Spectrometry facility at the 3 MeV Pelletron laboratory was declared operational by the National Accelerator Mass Spectrometry Committee.

9.05 Harish-Chandra Research Institute (HRI), Allahabad. The main objective of HRI 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.

9.06 Institute of Mathematical Sciences (IMSc.), Chennai-IMSc., established in 1962 is a National Institute of higher learning whose primary objective is to foster high quality fundamental research in frontier disciplines of Mathematical Sciences. The Institute has dynamic programme for pursuing research in three disciplines: Theoretical Physics, Mathematics and Theoretical Computer Science. The research output of the

Institute has received international recognition and has led to several collaborative research projects with foreign scientists.

The Institute is actively involved in the International collaborative research programmes at CERN (Switzerland), BNL (USA), LNL (Italy) and other laboratories abroad. Under the STAR collaboration, the Institute contributed in the fabrication, testing and commissioning of the Photon Multiplicity Detectors, which have been installed at the Relativistic Heavy Ion Collider at BNL, USA.

The Institute promotes interactions with the universities, academic institutions and other research laboratories. MOUs were signed with Utkal and Sambalpur universities for mutual collaborations and academic exchanges. Refresher courses in Physics were conducted for college and university teachers during this year. More than 150 research papers were published in international journals, books and conference proceedings.

9.07 Institute for Plasma Research (IPR), Gandhinagar - IPR 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 developmental 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.

9.08 Atomic Energy Education Society (AEES), Mumbai-AEES was established in 1969 to meet the educational needs of the children of employees of the Department working at different centres in the country. It administers 30 schools and junior colleges at 16 centres and provides education to over 26900 students. At present there are over 1780 employees of teaching and non-teaching categories.

The main objectives of AEES are: (a) to impart quality education to the children of the employees of the DAE and its Constituent Units (b) to design innovative programme for improving the academic standards in AEES schools and (c) to formulate institutional development plan in academics, games, sports and co-curricular activities.

The budgetary provisions pertain to the establishments at Mumbai and Hyderabad, while the allocation for other centres are made by the respective DAE Units.

10. Assistance to Universities - The research-education linkage has always nurtured by DAE. Extra-mural funding from DAE to universities, institutions, national laboratories, etc. is channeled through the Board of Research in Nuclear Sciences (BRNS). National Board for Higher Mathematics (NBHM) has initiated several schemes like helping the development of mathematical centres, giving scholarships to research fellows, travel assistance to young mathematicians for attending conferences/seminars, support to libraries, etc. The Department also funds cancer hospitals in the country which support primarily small projects and radiation related equipment for cancer treatment.

To nurture nuclear technology, the endeavor of the Department covers training programme for its scientists/engineers, programme under the inter-university consortium for utilisation of DAE research facility, enrichment of higher science education through intervention of its experts with university system and training facilities/fellowships extended to countries through IAEA or under the bilateral agreements. As part of human resource development, a number of training courses, seminars, symposia and workshops are regularly conducted by the DAE Units.

With the objective to deliver the technologies developed in

the DAE laboratories to the people around the nuclear establishments, the department has initiated the Neighborhood Welfare Programme. Welfare activities such as eye camps, health check-ups, renovation of primary schools, providing educational facilities, distribution of high yield seeds and emerging plant visits are carried out by the atomic power stations at different sites.

11. Directorate of Construction, Services & Estate Management (DCS&EM), Mumbai - DCSEM looks after the construction activities of the Departmental Units and Aided Institutions including housing for the employees. It is also responsible for operation, maintenance and up-gradation of various services of residential flats and utility buildings and estate management for the DAE Estate in Mumbai. In Mumbai there are 9781 flats including efficiency apartments, efficiency plus apartments under the maintenance control of this Directorate. This apart, the Directorate undertakes construction of residential flats, office and laboratory buildings for Constituent Units like VECC, etc. and Aided Institutions like TMC, TIFR, etc.

13. 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.

NUCLEAR FUEL

14. Nuclear Fuel Complex (NFC), Hyderabad - NFC is responsible for manufacturing alloy clad, natural and enriched Uranium Oxide Fuel Assemblies for all the Pressurised Heavy Water Reactors (PHWRs) and the Boiling Water Reactors (BWRs) respectively. 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.

15. Heavy Water Board (HWB), Mumbai - HWB was set up in the year 1989 to manage 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 (NFL). However consequent upon the decision of the Government to disinvest NFL, the HWP, Nangal has been closed down.

HWB is operating six Heavy Water Plants located at Baroda, Tuticorin, Kota, Manuguru, Thal and Hazira with a total designed/re-rated capacity of 500MT per year. While the four Heavy Water Plants operating at Baroda, Tuticorin, Kota & Manuguru are run departmentally, Heavy Water Plants at Thal and Hazira are operated and maintained by M/s. RCF & M/s. KRIBHCO respectively. HWP (Talcher) is being preserved along with some diversified activities such as Pilot Plant scale D2EHPA production & setting up of TBP Plant for meeting the requirement of BARC. The Boron Enrichment Pilot Plant Facility has been shifted from BARC to Talcher as part of diversification.

The flue gas conditioning technology developed by Heavy Water Board and transferred to M/s Chemithon Engineers Ltd. is being put to commercial use. HWB is continuing its programme of energy conservation which is a major thrust area in all its operating Plants in order to reduce further specific energy consumption per Kg. of heavy water produced, which would lead to reduction of production cost.

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 - Under this head budget provisions are sought for management Services group and contributions to the International Atomic Energy Agency (IAEA). Provisions sought for Thorium Plant are not required from RE stage.

20. DAE Projects - The Department undertakes a few projects, which are jointly executed by its Constituent Units and by the PSUs on behalf of the Department.

21. Grants-in-aid to Electronics Corporation of India Ltd. (ECIL), Hyderabad - ECIL was incorporated on 11th April 1967. The main objective of the company is to strengthen its status as a valued technological asset to the nation in the area of Strategic Electronics meeting the requirements of Atomic Energy, Defence, Space, Civil Aviation, Security and such other sectors of strategic importance. Budget provisions made as Grants-in-aid to this PSU are for R&D support it extends to the Nuclear Power Programme.

22. Investment in Public Enterprises

22.01 Provisions are made for Investment in Equity to support the Plan Schemes. Apart from ECIL, the following are the other PSUs to whom Investments in Equity are granted.

22.02 Uranium Corporation of India Ltd. (UCIL) Jaduguda - UCIL is incorporated in 1967 and operates uranium mines at Jaduguda, Bhatin and Narwapahar and Uranium Mill at Jaduguda in the state of Jharkhand. The company also operates a by-product recovery plant at Jaduguda to recover magnetite. The provisions included are for investment in equity against the ongoing Plan Schemes.

22.03 Indian Rare Earths Ltd. (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 Chatrapur in Orissa for processing the beach sand in the Orissa Coast.

The objectives of IREL are two fold: (i) to emerge as a leading player in the areas of beach sand mining, separation of contained heavy minerals and value addition thereon and (ii) to carry out production as well as selling in the domestic and international markets having due regard to strategic requirements, resource utilisation and safety/environmental protection.

IREL expects to fund most of its projects through IEBR except for minor budgetary support from Govt. of India as equity to meet the debt equity norms of funding industries.