

DEPARTMENT OF ATOMIC ENERGY**DEMAND NO. 4****Atomic Energy***(In ₹ crores)*

	Actual 2015-2016			Budget 2016-2017			Revised 2016-2017			Budget 2017-2018		
	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total
Gross	11250.57	5130.10	16380.67	12651.33	6031.15	18682.48	12950.20	5641.66	18591.86	13110.36	6506.08	19616.44
Recoveries	-81.66	-151.90	-233.56	-177.20	-142.70	-319.90	-162.54	-1258.90	-1421.44	-164.76	-1308.90	-1473.66
Receipts	-4842.71	...	-4842.71	-6680.10	...	-6680.10	-5207.92	...	-5207.92	-5681.58	...	-5681.58
Net	6326.20	4978.20	11304.40	5794.03	5888.45	11682.48	7579.74	4382.76	11962.50	7264.02	5197.18	12461.20
A. The Budget allocations, net of recoveries and receipts, are given below:												
CENTRE'S EXPENDITURE												
Establishment Expenditure of the Centre												
1. Secretariat	40.35	...	40.35	47.50	...	47.50	47.76	...	47.76	49.65	...	49.65
2. Atomic Energy Regulatory Board	46.89	...	46.89	56.00	0.01	56.01	54.28	0.20	54.48	57.88	0.01	57.89
3. Atomic Research Centres												
3.01 Bhabha Atomic Reseach Centre	1720.49	14.80	1735.29	1929.85	70.00	1999.85	1947.17	50.50	1997.67	1946.73	51.00	1997.73
3.02 Indira Gandhi Centre for Atomic Reseach, Kalpakkam	316.08	0.83	316.91	347.50	1.30	348.80	375.41	0.34	375.75	396.60	1.30	397.90
3.03 Raja Ramana Centre for Advanced Technology, Indore	196.98	0.42	197.40	228.10	1.01	229.11	241.50	1.00	242.50	254.84	1.00	255.84
3.04 Variable Energy Cyclotrone Centre, Kolkata	87.66	4.72	92.38	94.92	5.00	99.92	99.40	1.42	100.82	102.44	4.00	106.44
3.05 Atomic Minerals Directorate for Exploration and Research, Hyderabad	205.82	1.61	207.43	235.39	1.80	237.19	251.47	0.50	251.97	266.89	1.40	268.29
Total- Atomic Research Centres	2527.03	22.38	2549.41	2835.76	79.11	2914.87	2914.95	53.76	2968.71	2967.50	58.70	3026.20
4. Fuel Cycle Facility (NRB)	332.07	49.96	382.03	464.00	50.00	514.00	443.00	37.00	480.00	464.60	39.00	503.60
5. Service Units	245.84	...	245.84	264.89	...	264.89	286.50	...	286.50	295.57	...	295.57
6. Board of Radiation and Isotope Technology (BRIT)	65.17	...	65.17	70.40	...	70.40	75.50	...	75.50	79.26	...	79.26
7. Management Services Group	0.29	...	0.29	0.40	...	0.40	0.55	...	0.55	0.58	...	0.58
8. Nuclear Fuel Complex												
8.01 Gross Budgetary Support	1711.20	...	1711.20	1953.55	...	1953.55	2070.67	...	2070.67	1982.37	...	1982.37
8.02 Less Receipts	-1470.75	...	-1470.75	-2680.10	...	-2680.10	-1848.45	...	-1848.45	-2004.83	...	-2004.83
8.03 Less Recoveries	-17.14	...	-17.14	-79.00	...	-79.00	-65.00	...	-65.00	-70.00	...	-70.00
Net	223.31	...	223.31	-805.55	...	-805.55	157.22	...	157.22	-92.46	...	-92.46
9. Heavy Water Production Facility												
9.01 Gross Budgetary Support	48.33	977.44	1025.77	52.05	1051.53	1103.58	63.68	1061.59	1125.27	54.54	1110.18	1164.72
9.02 Less - Recovery	-9.69	-151.90	-161.59	...	-142.70	-142.70	...	-1164.00	-1164.00	...	-1214.00	-1214.00

(In ₹ crores)

	Actual 2015-2016			Budget 2016-2017			Revised 2016-2017			Budget 2017-2018		
	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total
<i>Net</i>	38.64	825.54	864.18	52.05	908.83	960.88	63.68	-102.41	-38.73	54.54	-103.82	-49.28
Total-Establishment Expenditure of the Centre	3519.59	897.88	4417.47	2985.45	1037.95	4023.40	4043.44	-11.45	4031.99	3877.12	-6.11	3871.01
Central Sector Schemes/Projects												
Research and Development												
10. R and D Basic Science and Engineering	...	1161.31	1161.31	...	850.90	850.90	...	892.00	892.00	...	982.32	982.32
11. R and D for Fast Reactor Science and Technology	...	288.58	288.58	...	440.10	440.10	...	282.10	282.10	...	294.07	294.07
12. Advanced Technologies for Laser, Synchrotron and Accelerator	...	173.38	173.38	...	218.00	218.00	...	180.00	180.00	...	152.53	152.53
13. R and D in Exploration and Mining	...	109.67	109.67	...	155.00	155.00	...	147.00	147.00	...	122.50	122.50
14. Grants to other Institutions	151.14	...	151.14	220.00	...	220.00	150.00	...	150.00	163.84	...	163.84
Total-Research and Development	151.14	1732.94	1884.08	220.00	1664.00	1884.00	150.00	1501.10	1651.10	163.84	1551.42	1715.26
15. Backend Fuel Cycle Projects	...	236.82	236.82	...	700.00	700.00	...	350.00	350.00	...	500.00	500.00
Housing and Neighbourhood Development Projects												
16. Housing Projects	...	191.73	191.73	...	221.00	221.00	...	117.00	117.00	...	220.15	220.15
17. Neighbourhood Development Project (in Kudankulam)	75.00	...	75.00	50.00	...	50.00	50.00	...	50.00	21.00	...	21.00
Total-Housing and Neighbourhood Development Projects	75.00	191.73	266.73	50.00	221.00	271.00	50.00	117.00	167.00	21.00	220.15	241.15
Heavy Water Facilities												
18. Heavy Water Board	...	80.05	80.05	...	60.00	60.00	...	15.00	15.00	...	46.20	46.20
19. <i>Feedstock</i>												
19.01 Gross Budgetary Support	...	1042.62	1042.62	...	1105.00	1105.00	...	1124.00	1124.00	...	1174.00	1174.00
19.02 Less Recoveries	...	-1042.62	-1042.62	...	-1105.00	-1105.00	...	-94.90	-94.90	...	-94.90	-94.90
<i>Net</i>	...	...	...	...	...	...	...	1029.10	1029.10	...	1079.10	1079.10
20. <i>Heavy Water Pool Management</i>												
20.01 Gross Budgetary Support	1200.00	...	1200.00	1200.00	...	1200.00	1285.00	...	1285.00	1285.00	...	1285.00
20.02 Less Receipts	-1200.00	...	-1200.00	-1200.00	...	-1200.00	-1285.00	...	-1285.00	-1285.00	...	-1285.00
<i>Net</i>	...	...	...	...	...	...	...	...	...	...	...	...
Total-Heavy Water Facilities	...	80.05	80.05	...	60.00	60.00	...	1044.10	1044.10	...	1125.30	1125.30
21. Radiation and Isotopes Project	...	33.74	33.74	...	110.00	110.00	...	47.60	47.60	...	124.50	124.50
22. Nuclear Power Projects	20.00	...	20.00	83.86	30.00	113.86	83.86	0.15	84.01	54.90	21.00	75.90
23. Nuclear Fuel Projects	...	120.00	120.00	...	150.00	150.00	...	140.00	140.00	...	156.95	156.95
24. AERB Expansion Project	2.34	6.89	9.23	2.50	47.50	50.00	1.00	9.68	10.68	2.50	27.23	29.73
25. Advanced Technology for Acclerator	...	91.89	91.89	...	95.00	95.00	...	61.00	61.00	...	73.50	73.50
26. DAE R and D Projects	7.72	93.12	100.84	8.70	160.00	168.70	8.31	77.58	85.89	6.79	314.35	321.14
27. DAE I and M Projects	30.00	3.00	33.00	25.00	93.00	118.00	25.00	5.00	30.00	25.00	48.89	73.89
28. Fuel Cycle Projects FRFCF	...	369.14	369.14	...	900.00	900.00	...	437.00	437.00	...	420.00	420.00

(In ₹ crores)

	Actual 2015-2016			Budget 2016-2017			Revised 2016-2017			Budget 2017-2018		
	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total	Revenue	Capital	Total
29. Nuclear Fuel Inventory												
29.01 Gross Budgetary Support	2344.21	...	2344.21	3117.62	...	3117.62	3117.62	...	3117.62	3281.26	...	3281.26
29.02 Less Receipts	-2171.96	...	-2171.96	-2800.00	...	-2800.00	-2074.47	...	-2074.47	-2391.75	...	-2391.75
Net	172.25	...	172.25	317.62	...	317.62	1043.15	...	1043.15	889.51	...	889.51
Total-Central Sector Schemes/Projects	458.45	2959.32	3417.77	707.68	4230.50	4938.18	1361.32	3790.21	5151.53	1163.54	4583.29	5746.83
Other Central Sector Expenditure												
Autonomous Bodies												
30. Tata Institute of Fundamental Research, Mumbai	618.50	...	618.50	620.76	...	620.76	643.39	...	643.39	644.00	...	644.00
31. Tata Memorial Centre, Mumbai	525.00	...	525.00	432.00	...	432.00	452.00	...	452.00	472.12	...	472.12
32. Institute for Plasma Research, Gandhinagar	799.84	...	799.84	516.00	...	516.00	519.70	...	519.70	521.55	...	521.55
33. Other Autonomous Bodies	377.54	...	377.54	506.14	...	506.14	509.89	...	509.89	541.71	...	541.71
Total-Autonomous Bodies	2320.88	...	2320.88	2074.90	...	2074.90	2124.98	...	2124.98	2179.38	...	2179.38
Public Sector Undertakings												
34. Nuclear Power Corporation of India Limited (NPCIL)	...	389.00	389.00	...	400.00	400.00	...	400.00	400.00	...	370.00	370.00
35. Uranium Corporation of India Limited	...	32.00	32.00	...	200.00	200.00	...	200.00	200.00	...	200.00	200.00
36. Bharatiya Nabhikiya Vidyut Nigam Limited (BHAVINI)	...	700.00	700.00	...	20.00	20.00	...	4.00	4.00	...	50.00	50.00
Total-Public Sector Undertakings	...	1121.00	1121.00	...	620.00	620.00	...	604.00	604.00	...	620.00	620.00
Others												
37. Contribution to International Atomic Energy Agency	27.28	...	27.28	26.00	...	26.00	50.00	...	50.00	43.98	...	43.98
Total-Other Central Sector Expenditure	2348.16	1121.00	3469.16	2100.90	620.00	2720.90	2174.98	604.00	2778.98	2223.36	620.00	2843.36
Grand Total	6326.20	4978.20	11304.40	5794.03	5888.45	11682.48	7579.74	4382.76	11962.50	7264.02	5197.18	12461.20
B. Developmental Heads												
Economic Services												
1. Power	272.06	...	272.06	461.48	...	461.48	1187.01	...	1187.01	977.41	...	977.41
2. Industries	1122.66	...	1122.66	293.50	...	293.50	1219.75	...	1219.75	989.15	...	989.15
3. Atomic Energy Research	4891.13	...	4891.13	4991.55	...	4991.55	5125.22	...	5125.22	5247.81	...	5247.81
4. Secretariat-Economic Services	40.35	...	40.35	47.50	...	47.50	47.76	...	47.76	49.65	...	49.65
5. Capital Outlay on Power Projects	...	389.24	389.24	...	253.50	253.50	...	206.15	206.15	...	255.07	255.07
6. Capital Outlay on Atomic Energy Industries	...	2026.97	2026.97	...	3540.33	3540.33	...	2410.79	2410.79	...	2882.20	2882.20

5. **Service Units:** Comprises of three Service Organisations: (i) Directorate of Purchase & Stores DPS, Mumbai, with the objective to ensure availability of quality material at right time, at right place and at right price, (ii) Directorate of Construction, Services and Estate Management (DCSEM), Mumbai is also responsible for operation, maintenance and up-gradation of residential flats, shops, public buildings and estate management including allotment and the security for the DAE Estate in Mumbai, (iii) General Services Organisation (GSO), Kalpakkam is one of the service organisations providing services such as residential accommodation, health services at Kalpakkam.

6. **Board of Radiation and Isotope Technology (BRIT):** Board of Radiation and Isotope Technology (BRIT) is responsible for Production and supply of a variety of radioisotope products including radiopharmaceutical and associated products, radio immunoassay kits, radiochemicals, radiolabeled compounds and nucleotides and also sealed radiation sources such as Cobalt-60, Iridium-192, Caesium-137 etc. Radiation technology equipment such as gamma radiography cameras, blood irradiators and laboratory gamma irradiators, promoting radiation processing technology for use in healthcare, food processing and agriculture and rendering radiation processing services for medical products, spices, condiments and other products, propagating radiation technology and providing facilitation services to private entrepreneurs to set up commercial gamma radiation processing plants.

7. **Management Services Group:** Responsible for coordination in implementation of various activities.

8. **Nuclear Fuel Complex:** Nuclear Fuel Complex (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) 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.

9. **Heavy Water Production Facility:** HWB operates two Heavy Water Plants (HWP) located at Kota and Manuguru based on Hydrogen Sulphide-Water Exchange Process and two plants at Thal and Hazira based on Ammonia-Hydrogen Exchange Process.

10. **R and D Basic Science and Engineering:** R&D efforts are concentrated in the fields of nuclear sciences, engineering & technology, basic sciences and allied fields and geared up for exploitation of atomic energy for power generation and application of radiation technology in the areas of agriculture, health care and industry.

11. **R and D for Fast Reactor Science and Technology:** Indira Gandhi Centre for Atomic Research (IGCAR) is engaged in design and development of liquid sodium cooled fast breeder reactors in the country, as a part of the Nuclear Power Programme Stage 2, backed by fuel fabrication and reprocessing. Fast Breeder Test Reactor (FBTR), a prelude to the FBR programme, has been in operation with indigenously developed Uranium-Plutonium carbide fuel.

12. **Advanced Technologies for Laser, Synchrotron and Accelerator:** The design and installation of electron 10 MeV Linac system, isolation shielding and the ozone containment in the accelerator wall is being developed for the agricultural radiation processing facilities.

13. **R and D in Exploration and Mining:** 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.

14. **Grants to other Institutions:** DAE through Board of Research in Nuclear Sciences (BRNS), National Board for Higher Mathematics (NBHM) and Homi Bhabha National Institute (HBNI) promotes research in nuclear and allied fields and mathematics, respectively.

15. **Backend Fuel Cycle Projects:** Construction of Integrated Nuclear Recycle Project to improve supply of fuel to 2nd stage of Nuclear Power Programme.

16. **Housing Projects:** Housing projects look after the construction activities of the Department including housing for its employees. The Directorate is also responsible for operation, maintenance and up-gradation of residential flats, shops, public buildings and estate management including allotment. In addition, Directorate executes construction works for constituent units.

17. **Neighbourhood Development Project (in Kudankulam):** Creation of network for need based social outreach activities in and around DAE facilities and set up awareness programmes for target audience.

18. **Heavy Water Board:** Works in the area of non-nuclear applications of Deuterium (D) and HW in the field of medicines, life sciences, communication and micro-electronics, HWB has undertaken synthesis of various D-labeled compounds.

19. **Feedstock:** Value of Heavy Water acquisition/production during the financial year.

20. **Heavy Water Pool Management:** Interest of Government Capital deployed for Heavy Water held in Pool Management.

21. **Radiation and Isotopes Project:** Construction of Fission moly project for enhancement in capacity for storing irradiated Co-60.

22. **Nuclear Power Projects:** Includes projects which are jointly executed by the constituent units in Power sectors or by Public Sector Units on behalf of the Department.

23. **Nuclear Fuel Projects:** Setting up of Fuel Fabrication Facility along with Zircaloy Fabrication Facility for producing fuel bundles to meet the requirement of PHWR reactors.

24. **AERB Expansion Project:** Construction of new building at Headquarter and Regional Regulatory Centers for capacity building of AERB for effective monitoring.

25. **Advanced Technology for Accelerator:** Installation of medical cyclotron, advance computing, design of ANURIB and development of superconducting accelerator components will lead to future research in nuclear physics.

26. **DAE R and D Projects:** Includes projects which are jointly executed by the constituent units in R&D sectors or by Public Sector Units on behalf of the Department.

27. **DAE I and M Projects:** Includes projects which are jointly executed by the constituent units in I&M sectors or by Public Sector Units on behalf of the Department.

28. **Fuel Cycle Projects FRFCF:** Fuel Cycle Projects FRFCF of IGCAR is an integrated facility to close the fuel cycle of the prototype Fast Breeder Reactor (PFBR).

29. **Nuclear Fuel Inventory:** It is inventory management of Heavy water Production from various Heavy Water Production Facilities.

30. **Tata Institute of Fundamental Research, Mumbai:** Tata Institute of Fundamental Research (TIFR) is primarily an institute for basic research and it also develops new technologies and creates a pool of scientific and technical manpower.

31. **Tata Memorial Centre, Mumbai:** Tata Memorial Centre is an autonomous body under the Department of Atomic Energy. It comprises of Tata Memorial Hospital and Advanced Centre for Treatment, Research & Education in cancer.

32. **Institute for Plasma Research, Gandhinagar:** IPR carry out experimental and theoretical research in plasma science. The Institute has a mandate to stimulate plasma research and development activities in the Universities and Industrial sector. India has joined International Thermonuclear Experimental Reactor (ITER). IPR is fully associated with this project.

33. **Other Autonomous Bodies:** Saha Institute of Nuclear Physics (SINP) , Kolkata , Institute of Physics (IOP) ,Bhubaneswar, National Institute of Science Education and Research (NISER),Bhubaneswar, Harish-Chandra Research Institute (HRI),Allahabad, Institute of Mathematical Sciences (IMSc) , Chennai, Ahmedabad, Homi Bhabha National Institute, Mumbai and Atomic Energy Education Society (AEES) , Mumbai.

34. **Nuclear Power Corporation of India Limited (NPCIL):** NPCIL is nodal agency to undertake the design, construction, operation and maintenance of the Atomic Power Stations for generation of electricity under the provisions of the Atomic Energy Act, 1962.

35. **Uranium Corporation of India Limited:** Uranium Corporation of India Limited was set up with the specific objective of mining and processing of uranium ore to produce uranium concentrate.

36. **Bharatiya Nabhikiya Vidyut Nigam Limited (BHAVINI):** The objective of BHAVINI is to plan execute, and operate an integrated programme of Fast Breeder Technology based Nuclear Power Stations for generating electricity on a commercial basis, commencing with PFBR.

37. **Contribution to International Atomic Energy Agency:** India has been a member of the Board of Governors of the International Atomic Energy Agency (IAEA) since its inception, making available the services of the departmental scientists for expert assignments besides participation in international symposia and other fellowship exchange programmes. The provision under IAEA takes care of the contribution made by the Department to the international body.