Annex-1

Physical targets for continuation of PRIS (Organizational)

For the period from 1.04.2017 to 31.03.2020

Sl. No	Unit	Project / Activity	Physical target - September 2018	Physical target - March,2020
1	2	3	4	5
1	AMD	Geological - Identification and delineation of potential areas and Augmentation of additional uranium reserves	(a) Reconnaissance Survey (10,000 Sq. Km.) (b) Geochemical Survey (6,750 Sq. Km.) (c) Detailed Survey (500 Sq. Km.) (d) Departmental Drilling (1,36,000 m) (e) Contract Drilling (3,00,000m)	(a) Reconnaissance Survey (11,000 Sq. Km.) (b) Geochemical Survey (7,500 Sq. Km.) (c) Detailed Survey (550 Sq. Km.) (d) Departmental Drilling (1,42,000m) (e) Contract Drilling (3,15,000m)
2	AMD	Airborne Survey - Identification and delineation of potential areas for further exploration by ground survey	(a) Airborne Geophysical Survey (1,00,000 L km) (b) Remote Sensing and GIS (5,500 Sq Km.) (c) Ground Geophysical (1400 Sq. Km.)	(a) Airborne Geophysical Survey (1,10,000 L km) (b) Remote Sensing and GIS (6,500 Sq Km.) (c) Ground Geophysical (1,600 Sq. Km.)
3	AMD	Rare Metal and Rare Earth - Delineation and augmentation of Columbite-Tantalite; Beryl and Xenotime reserves	(a) Reconnaissance Survey (1,500 Sq. Km.) (b) Detailed Survey (6 Sq. Km.) (c) Recovery of Columbite - Tantalite (4,000 Kg) (d) Recovery of Xenotime (8,000 Kg)	(a) Reconnaissance Survey (1,725 Sq. Km.) (b) Detailed Survey (7.5 Sq. Km.) (c) Recovery of Columbite - Tantalite (4,250 Kg) (d) Recovery of Xenotime (8,500 Kg)

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1	2	3	4	5
4	AMD	Beach Sand and Offshore - Augmentation of Beach Sand Heavy Minerals (Monazite and Zircon reserves)	(a) Reconnaissance Survey (400 Sq. Km.) (b) Detailed Survey (11 Sq. Km.) (c) Beach Sand Drilling (12,000 m)	(a) Reconnaissance Survey (425 Sq. Km.) (b) Detailed Survey (13 Sq. Km.) (c) Beach Sand Drilling (12,600 m)
5	BARC	**Development of new radiation induced mutants in crop plants with desirable traits, production of breeder seeds and management of insect pests.** **Development and evaluation of new radiation processed food products.** (a) Development and evaluation of various pulse genotypes with better attributes like disease resistant, large-seeds, high-yielding and / or early maturing (b) Evaluation of new Trombay oilseed lines in National/State trials for yields and other agronomic characters. (c) Development of a microbial formulation for enhanced composting of plant residues (d) To cover 100 ha of farmers' field under chickpea cultivation for seed treatment with *Trichoderma* mutant-based formulation TrichoBARC	(a) Development of genotypes (b) Gamma field evaluation (c) Lab scale demonstration (d) Experimental demo in 10 ha field	a) Field level demonstration b) Completion of yield trials c) Field level demonstration d) Full scale demonstration

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		(e) Screening of bio-components for developing biosensor kit to detect (a) organophosphate pesticides and (b) micronutrient (Zinc)	(e) Parameter optimization, calibration, performance evaluation and testing	e) Technology demonstration and transfer
		(f) Multi-location evaluation of high-yielding, rust-resistant wheat and rice (fine grain quality) lines	(f) Evaluation of TAW-33 wheat line and pre-release of the BARCKKV-13 rice line in Maharashtra State	f) Evaluation 3 each of wheat and rice lines in state and national trials and release
		(g) Multi-location evaluation of three advanced breeding lines of groundnut in All India Coordinated Research Project on Groundnut (ICAR) and State Agricultural University trials	(g) Initiation of multi-location trials	g) Completion of trials and necessary action for varietal release
		(h) Breeder seed multiplication of Trombay groundnut varieties (300 quintals) and their deployment among different seed agencies	(h) Seed multiplication	h) Deployment and feedback
6	BARC	**Lasers, plasma and electron beam development activities** a. Establishing National Neutron Radiography Facility at ECIL, Hyderabad.	a. Refurbishment of 9 MeV Linac at ECIL site	a. Commissioning of Facility demonstrating Neutron Radiography.
		b. Setting up of 1 MeV, 100 kW DCA for Waste water treatment facility at STP, Trombay.	b. Major component fabrication & procurement to be completed	b. MLD waste water treatment demonstration on pilot plant level.
		c. Refurbishment of Electron Beam Ion-Trap facility	c. All hardware procurement will be realised.	c. Demonstration of Carbon ion beam trap

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		d. EMM welding demonstration of D9/ODS fuel tube to SS 316 LN/ODS end-plug for PFBR application.	d. D9 to SS316LN reliable and repeatable weld demonstration	d. ODS weld demonstration and weld window generation.
		e. Electron Beam (EB) Welding / Melting Machines for Specific Applications.	e. To develop a 5 kW EB Gun for conducting Thermal Simulation Studies.	e. Develop a compact 10 kW EB Welding machine for Glove box application.
		f. Design and Development of facility for a 60 kW Plasma Incinerator for low-level alpha activity/municipality waste.	f. In-house plasma gun will be demonstrated for continuous usage during incineration in WIP facility	f. Complete facility demonstration run at full 60 kW power.
		g. Technology Demonstration of Indian Cargo Scanner 'Gantry' variant at Gamma Field.	g. Design completion.	g. Fabrication & Demonstration.
		h. Prototype development of LLRF system consisting of Up converter, Down converter, LLRF chassis, Master Oscillator and RF Ref distribution and Resonance control chassis, with associated control software for HTS and SSR1 Cryomodule for IIFC.	h. Lab testing of LLRF System for HTS	h. Testing and evaluation of LLRF system at Fermilab to be completed. Integration of LLRF system with HTS to be completed at RRCAT. LLRF system to be ready for integration with SSR1 at Fermilab.
7	BARC	**Development of clean water technologies** a. Water Treatment Plant (WTP) at Shivganga Pond, Deoghar under	a. Installation and commissioning of WTP.	a. Analysis of the performance data will be carried out.

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		DAE outreach program		The technical andimplementation model will be standardized.
		b. I&M-07: OSCOM: 5 MLD seawater desalination plant at OSCOM, IREL	b. Placement of PO for 0.5 MLD MED-TVC thermal desalination plant Placement of PO for 4.5 MLD membrane based RO systems.	b. Delivery and safe custody of subsystems of MED and SWRO at site.
		c. Endurance test and life assessment of indigenously developed SWRO membrane modules	c. Endurance test of indigenously developed SWRO membrane modules	c. Life assessment , standardization and technology diffusion of indigenously developed SWRO membrane modules
		d. Development of hydrogen permselective metallic membranes	d. Optimisation of parameters for fabrication and characterisation of metallic membranes of different types Benchmarking of the separation performance based on existing membranes	d. Technology demonstration for recovery of hydrogen from Helium with indigenously developed metallic membranes
		e. Development of polymeric-inorganic membrane /diaphragm for alkaline water electrolysers	e. Optimisation of parameters for fabrication and characterisation of diaphragms Testing and performance evaluation of developed membranes in lab scale facility.	e. Technology demonstration of diaphragm for compact alkaline water electrolysis for hydrogen production
8.	BARC	**Design, development, construction and operation of enrichment facilities for strategic programme**		
		a. Demonstration of higher diameter advanced metallic longer machine cascade.	a. Design, cascade configuration and material mobilization will be completed in addition to cascade	a. Will be completed by 2020

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			hall modifications.	
		b. Induction of rigid CFR machine cascade.	b. Design, cascade configuration and material mobilization will be completed in addition to cascade hall modifications.	b. Will be completed by 2020
		c. Installation of additional cascades of advanced machine to increase production capacity at RMP, Mysuru.	c. Addition of three cascades.	c. Addition of another four cascades.
		d. Installation of Very high output G8 pilot cascade at Mumbai and working for G8 model suitable for deployment at RMP Mysore and later on at SMF Chitradurga.	d. Fabrication and running of few G8 units for process optimization trials.	d. Installation at RMP, Mysore will be completed
		e. Development of two section CFR rotor system	e. Testing and qualification of bellow for 2-section rotors at full speed.	e. Prototype will be completed
		f. Development of PM-BLDC high capacity motors suitable for Very High output Machines and deployment in pilot cascade.	f. Integration and testing of PM-BLDC motors on metallic rotors, CFR rotor and process trials.	f. Integration in pilot cascade for multi-motor operation will be completed.
		g. Demonstration facility for plasma based Dry route reduction of UF6 @ 2 KG per hour.	g. Commissioning will be completed and trials will start.	g. Will be completed
		h. Development of tower reactor for studying g-s reaction.	h. Erection of set-up has started. By 2018, few operational trials will be conducted	h. Will be completed.
9.	BARC	**High performance computing infrastructure**		
		a. High Performance Computing infrastructure	a. Development of 6 PB High Capacity SAN Storage System	a. Development of 750 Teraflops parallel supercomputer
		b. Motorised Slave Arm Manipulator (MASM) for NRB	b. Haptic device for Master Arm	b. b. Complete MSAM ready for installation

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10	BARC	**Development of Radiation Detectors, Radiation monitoring & Upgradation of Emergency Response Centres**		
		a. Development of High Flux Neutron irradiation facility	a. Design and development of the core of the facility	a. Installation, commissioning of the facility and standardisation of the neutron and gamma field for the facility
		b. MoU with ISRO for development of ERM-SAT (Environmental Radiation Monitor with SATellite communication).	b. Development and production of 10 prototype units of ERM-SAT	b. Production and installation of 200 units of ERM-SAT
		c. Development of Compact Environmental Radiation Monitoring System standalone and with Navigational aid for radiation mapping.	c. Calibration and Field Trials	c. Production and deployment at DAE Emergency Response Centres
		d. Development of Hand-held portable Spectrometer and Zigbee based field deployable Environmental Radiation Monitor	d. Testing, calibration and identification of radio isotopes from library	d. Production of 25 Units
		e. Mobile Radiological Impact Assessment Laboratory	e. Setting up of lab.	e. Setting up oftwo labs.
		f. Fabrication and commissioning of Quick Scan Whole Body Counting Systems, portable thyroid and static organ monitoring system	f. Installation and Commissioning of one Quick scan WBCS system and a Portable thyroid monitor	f. Development of One Qucik Scan WBC and a Static Organ Monitor
		g. Fabrication of automated system for initial processing of faecal samples	g. Robotic system for sample placement in crucible.	g. Completion of full system
		h. Development and installation of Central Radiation Monitoring Station (CRMS) for monitoring radiation field due to neutron and gamma in glove box trains.	h. Installation of five monitors each neutron and gamma in a single glove box train.	h. Installation of additional 20 monitors each for neutron and gamma radiation.
		i. Upgradation of TLD personnel monitoring laboratories to include	i. Setting up of new server-client systems for online registration of	i. Online registration of non-DAE

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		online registration of non-DAE radiation workers and accreditation of new laboratories.	non-DAE radiation workers.	radiation workers through laboratories accredited.
		j. Establishment of Nationwide environmental gamma radiation mapping.	j. Quarterly environmental gamma radiation monitoring in Karnataka, Maharashtra, Andhra Pradesh and Telangana will be carried out.	j. Nationwide environmental gamma radiation mapping based on environmental TLD monitoring will be generated.
11	BARC	**Construction and operation of power reactor fuel recycle facilities at Tarapur and Kalpakkam**		
		a) Operation and maintenance of PREFRE-2 and WIP at Tarapur, KARP and WIP, Hot commissioning of P3A ,CWMF at Kalpakkam.	a) Continued operation and maintenance of PREFRE-2 and WIP at Tarapur, KARP, P3A, WIP, CWMF at Kalpakkam.	a) Continued operation and maintenance of PREFRE-2 and WIP at Tarapur, KARP, P3A, WIP, CWMF at Kalpakkam.
		b) Operation and maintenance of AFFF and commissioning of fabrication Line-4 of AFFF at Tarapur.	b) Continued operation and maintenance of AFFF at Tarapur including fabrication line-4.	b) Continued operation and maintenance of AFFF at Tarapur including fabrication line-4.
		c) Construction of AVS-3 at Tarapur has been started.	c) Construction of AVS-3 at Tarapur will continue.	c) Completion of construction of AVS-3 at Tarapur.
		d) Detailed design and engineering of Alpha Waste Transit Storage Facility (AWTSF) at Tarapur is in progress.	d) Construction of Alpha Waste Transit Storage Facility (AWTSF) at Tarapur will continue.	d) Completion of construction of Alpha Waste Transit Storage Facility (AWTSF) at Tarapur.
		e) Design of Alpha Waste Storage Facility (AWSF) at Kalpakkam.	e) Detailed design and engineering of Alpha Waste Storage Facility (AWSF) at Kalpakkam.	e) Commencement of construction of Alpha Waste Storage Facility (AWSF) at Kalpakkam.
		f) Civil construction of Phase-II of vitrified waste storage facility at Kalpakkam	f) Civil construction and installation of equipment for vitrified waste storage facility at Kalpakkam	f) Commissioning of vitrified waste storage facility at Kalpakkam

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		g) Construction of Uranium oxide facility at Kalpakkam. h) Commissioning of ASFSF at Tarapur. i) Construction of front end blocks of INRP at Tarapur. j) Detailed design of INRP Fuel Fabrication Facility.	g) Commissioning of Uranium oxide facility at Kalpakkam. h) Completion of commissioning and commencement of operation of ASFSF at Tarapur. i) 30% Completion of Integrated nuclear recycle plant construction j) Commencement of construction of INRP Fuel Fabrication Facility.	g) Continued operation of Uranium oxide facility at Kalpakkam. h) Continued operation of ASFSF at Tarapur. i) 80% Completion of Integrated nuclear recycle plant construction j) 60% Completion of INRP Fuel Fabrication Facility.
12	BARC	**Frontiers in Physics and cutting edge technologies** a. Establishment of synchrotron X-ray absorption spectroscopy facilities for (i) Surface/Interface measurement & characterisation of multilayer devices, (ii) Radioactive samples and characterisation of actinides (iii) X-ray magnetic circular dichroism (XMCD) measurement facility and characterisation of Heusler alloy and multiferroic materials b. Design & Development of short radiation hard optical periscope for inspection in hot cell of Waste Immobilisation Plant c. (i) Nuclear structure studies with thermal neutron induced fission at Dhurva. (ii) Reactor anti-neutrino studies for	a. Establishment of the facilities b. Design of the periscope c. (i) Installation of beam-line and experimental set up will be completed. Experiments will be carried out.	a. Characterisation of (i) multilayer devices (ii) actinides important in nuclear applications , (iii) Characterisation of Heusler alloy and multiferroic materials a. Development & commissioning of the periscope b. Will be Completed (100%)

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		nuclear safe guard (Plutonium monitoring) and search for sterile neutrino, (iii) High energy physics studies with CMS and its upgrade at LHC, (iv) Nuclear Physics studies using international facilities for nuclear data for energy and nuclear astrophysics application, viz., CERN(TOF), GANIL, IPN-Orsay,LNL, ILL and GEANT-V. d. Augmentation of experimental facility for Pelletron-LINAC utilization of secondary neutron and heavy ion beams. e. (i) Development of ECR based Heavy Ion accelerator facility leading to RIB. (ii) Muon tomography for contraband material detection. f. Setting up of (i) THz Spectroscopy facility for studies of explosive, Tissues, Nucleic acid, Polymer, Ceramics & Glasses etc. (ii) Gas loading facility of for Diamond Anvil Cell (DAC) for high pressure studies of rare gasses and their intermolecular complexes (iii) Pressure Calibration set up at Brillion Scattering Facility and measurement of elastic constants of novel ferroelectric materials as	(ii) Development of 20 plastic detector setup for anti-neutrino detection. (iii) GE1/1 upgrade for CMS and LHC to GEM detectors (iv) Performance test for the first prototype of the GASPARD-Array will be completed d. Experiments using upgraded detector facilities will be carried out. e. (i) Development and testing of prototype RFQ (ii) Z-identification on the basis of muon scattering with 6 Resistive plate chambers (RPCs). f. 50% completion of facilities	c. Will be Completed (100%) d. Will be Completed (100%) e. Will be Completed (100%)

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		a function of pressure. (iv) In-situ Raman measurement facility for experimenting super hard materials under high temperature (by laser heating) and high pressure. g. (i) Installation of the MACE telescope mechanical structure, 356 mirror panel, full 68 CIM imaging camera, data acquisition system and it's commissioning. (ii) Trial engineering/physics runs to validate the functioning of various MACE telescope subsystems and observation on very high energy gamma-ray sources from Hanle. h. Manufacture & delivery of (i) Four (different types) advanced mass spectrometers (ii) Mass Spectrometer based He Leak Detector and Residual Gas Analyzer (iii) Development of crystals for gamma spectrometer and dosimetry, and solid state neutron detectors (iv) Development of a portable mobile charging system using flexible organic solar cells and Development a DCCT sensor and electronics for DAE accelerators	g. (i) Completion of installation of the MACE telescope mechanical structure along with its imaging camera. (ii) Completion of engineering runs and analysis of trial data collected with the telescope. h. Completion 50%	f. Will be Completed (100%) g. Will be completed (100%)

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1	2	3	4	5
		i. Development of IR absorption basedammonia breath analyser j. LLRF and BPM system for LEHIPA (i) Beam characterization with BPM system. (ii) Characterisation of BPM sensors with precision test bench. (iii) Development of new analog front-end module and analog multiplexer modules and integration with LLRF system for LEHIPA	i. Completion 20% j. (i) BPM system and sensor to be installed on Beam diagnostic bench for characterisation of beam. (ii) Lab testing of new analog front module and analog multiplexer with LLRF system.	h. Will be completed (100%) i. (i) Final integration of the complete system and software with other sub components at LEHIPA site.
13	BARC	**Compact LWR programme** a. 1st packaged reactor based on LWR technology b. 2nd packaged reactor based on LWR technology c. 3rd packaged reactor based on LWR technology d. Development of large size forgings (340 & 750 mm thick) for IPWR e. Operation of CLWRP, Kalpakkam in campaign mode and training of personnel	a. Operation and regulatory support to the first packaged reactor b. Completion of pre-commissioning trials of various reactor systems c. Integration of major equipment of the plant d. Completion of first shell forging (340 mm thick) e. Completion of training of 2 batches of personnel in operation of CLWRP. Completion of 2 nos. of Reactor operation campaigns of CLWRP and generation of data for the evaluation	a. Operation and regulatory support to the first packaged reactor b. Start-up of 2nd packaged reactor c. Completion of construction of 3rd packaged reactor d. Completion of 2nd shell forgings (750 mm thick) e. Completion of training of 4 batches of personnel in operation of CLWRP. Completion of 4 nos. of Reactor operation campaigns of CLWRP and generation of data for the evaluation

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			of the performance of equipment / components after refurbishment	of the performance of equipment / components after refurbishment.
14	BARC	**Infrastructure development at BARC, Trombay** a. New Engineering Halls 9,10,11,Research Laboratory in BARC, Trombay. b. New wing of BARC Hospital, Anushaktinagar c. 1.25 MV Roof Top Solar Power Units, Solar Water Heating Systems 13000 Liter capacity, New 2 MLD Sewage Water Treatment System, in BARC, Trombay.	a. 90% of this activity will be completed b. RCC structure will be completed & finishing works will be initiated. c. 30% of this activity will be completed	a. 100%. New Engineering Halls 9, 10, 11, Research Laboratory in BARC, Trombay will be Commissioned. b. 100%. New wing of BARC Hospital, Anushakti nagar will be Commissioned. c. 100%. Installation & commissioning
15	BARC	**R&D activities and Operation of reprocessing and waste management facilities at Trombay** a. Operation &Maintenance: (i) Continuing regular operation of Waste Management Facilities (ETP-DC, RSMS & WIP) (ii) Continuing regular operation of Reprocessing Facility (PP) (iii) Operation of MWPF forprocessing of alpha metallurgical waste at 5 batches/ year	a. Operation & Maintenance: (i) Continuing regular operation of Waste Management Facilities (ETP-DC, RSMS & WIP) (ii) Continuing regular operation of Reprocessing Facility (PP) (iii) Operation of MWPF forprocessing of alpha metallurgical waste at 5 batches/ year	a. Operation & Maintenance: (i) Continuing regular operation of Waste Management Facilities (ETP-DC, RSMS & WIP) (ii) Continuing regular operation of Reprocessing Facility (PP) (iii) Operation of MWPF forprocessing of alpha metallurgical waste at 5 batches/ year

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		(iv) Production of Cs glass pencils (v) Continuous Supply of Sr-90/ Y-90 for radio therapeutic application b. Augmentation/ Modification/R&D : (i) Works of effluent transfer line from PP to ETP (ii) Works of waste transfer trench between AWTF –PH(WMD) -PP (iii) Works of waste transfer trench (PRTRF to WIP) (iv) Works,commissioning & operation of radioactive disposal modules • Multitier RCC module&Stone lined trenches module • Tile hole modules (v) Construction of interim storage facility at Trombay (vi) Fabrication & installation of demonstration facility for processing of non-metallic alpha bearing wastes	(iv) Production of Cs glass pencils (v) Continuous Supply of Sr-90/ Y-90 for radio therapeutic application (i) Civil works (70%)Mechanical works (30%) (ii) Civil &Mechanical works (100%) (iii) Civil works (10%) (iv) • Civil Works (100%)Commissioning (100%) • Civil (10%) (v) Detail engineering, safety review & NIT preparatory works (100%) (vi) Execution works & Commissioning (100%)	(iv) Production of Cs glass pencils (v) Continuous Supply of Sr-90/ Y-90 for radio therapeutic application Civil works (100%)Mechanical works (100%) Commissioning & regular operation (100%) Civil & Mechanical works (60%) • Mechanical works (100%) Commissioning & operation (100%) • Regular operation (100%) • Civil & Mechanical works (100%) (v) Civil & Mechanical works & commissioning (100%) (vi) Regular operation (100%)

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		(vii) Construction of Facility for alpha waste processing at Trombay	(vii) Project proposal, sanction, engineering layout, design & NIT preparatory works(100%)	(vii) Civil & Mechanical works (50%)
16.	BARC	**Development of materials for Department programmes**		
		a. Synthesis, preparation and fabrication of ceramics and glasses for nuclear and energy applications	a. Bulk high temperature superconducting ceramics, MAX phase coating, porous membranes, microspheres for radiotherapy.	a. Technology for the preparation and fabrication of glass and ceramic components for nuclear and energy applications
		b. Design and fabrication of Ni-Ti-Fe shape memory alloy hydraulic couplings for aerospace applications	b. Hydraulic couplings for joining 6-20mm Titanium half alloy tubings	b. Technology for the preparation and fabrication of Ni-Ti-Fe shape memory alloys and hydraulic couplings for joining Titanium half alloy tubings.
		c. Metallurgy of Reactor pressure vessel steel for LWR	c. Mechanical properties of RPV	c. Data base for manufacturing and performance of RPV steel
		d. Assessment of Fe-Zr alloys for thermodynamic and mechanical stability at elevated temperatures and pressures and in presence of radionuclides	d. Thermodynamical and mechanical properties of Laves phases in Fe-Zr and with inclusion of Ni and Cr will be completed	d. Thermodynamical and lattice dynamical stability on inclusion of radio-nuclides.
		e. Defect and He/Xe and diffusion properties of thoria and thoria-based mixed oxides containing urania and plutonia	e. Energetics of point defects and diffusional properties of He/Xe in thoria, thoria-urania.	e. Bubble formation & its migration, diffusional properties of thoria, thoria-urania, thoria-plutonia
		f. Evaluation of properties of aluminide coatings formed on Fe-Ni-Cr containing superalloy substrates by plasma-spraying and heat-treatments for high-temperature applications	f. Thermal oxidation resistance, oxidation kinetics of aluminides and also of composition profiles of alumina and adherences	f. Studies on performances of alumina pertaining to high-temperature applications

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		g. Process development studies for the recovery of uranium values from new occurrences (Kanchankayi) Bhima basin (Karnataka)	g. Characterisation and leachability studies to be completed.	g. Process development studies to be completed..
17.	BARC	**Development of Healthcare technologies** a. Installation and commissioning of new SPECT/CT system to facilitate functional and anatomical information in thyroid imaging and nuclear cardiology, which will enhance efficacy in treatment management for thyroid cancer and for nuclear cardiology. – b. Introducing use of new therapeutic radiopharmaceuticals (i) ^{68}Ga-PSMA / ^{177}Lu-PSMA: Metastatic Castration Resistant Prostate Cancer (* PSMA – Prostate specific membrane antigen) (ii) ^{177}Lu-trastuzumab: HER-2+ve Metastatic breast cancer (iii). ^{131}I-Rituximab: Relapsed/Refractory Lymphoma c. Immunomodulatory role of G1-4A and probable use as adjunct therapy in TB. d. Production of phage display library and isolating clone for nanobody against Tg (* Tg– Thyroglobulin)	a. Placement of order for system b. Regulatory approvals will be obtained c. Pharmaco-kinetics, pharmaco-dynamic and toxicity studies for G1-4A. d. Over-expression of anti-Tg nanobody.	a. Installation & commissioning b. Will be in full-fledged clinical use for therapy of cancer patients c. Phase I clinical trial for TB d. Demonstrate use of anti-Tg nanobody in Tg-IRMA and imaging (*IRMA - Immunoradio-metric assay).

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18.	BARC	**Research Reactor Development programme** a. Design & setting up of a Test Facility for Qualification & Testing of CLOE (Corrosion Loop Experiment) loop Design b. Capacity enhancement and replacement of Dhruva DG sets, including construction of new DG building meeting seismic and revised DBFL requirement. c. Research Reactors (Apsara Reactor Upgradation Project)	a. Placement of Purchase Order/Work Order for Fabrication b. Construction completion of the DG building and Receipt of three new DG sets at site. c. Completion of Project and First Approach to Criticality	a. Completion of Installation of the Test Set-Up b. 100% completion. c. Project will be completed in 2018
19.	BARC	Isotope applications & Radiopharmaceuticals development a. Preparation of reference standards for refractory materials followed by analysis of the corresponding samples directly as solid using LA-ICP-MS, GD-OES/MS or LIBS. b. Analysis of radioactive samples from nuclear reactor by SIMS to reveal the root cause of component failure. c. Standardizing NDA methods for analysis of finished reactor components for their quality assurance	a. One set of standards will be prepared. b. Method will be developed to investigate the corrosion mechanism in nuclear and reactor materials using imaging, depth and surface elemental profiling features of Secondary Ion Mass Spectrometer (SIMS). c. Development of AIDNEC system for active NDA of 235U based nuclear	a. Four set of standards will be prepared. Inter-laboratory comparison experiment will be conducted for their certification. Direct solid analysis analytical technique will be made available for CQC of refractory materials. b. Utilization of the developed methodology to understand the corrosion phenomenon in nuclear and reactor material with an objective to identify the root cause of component failure. c. QA/QC of finished reactor components by ion beam analysis

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			materials	techniques.
		d. Development of separation methods for the recovery of Ru and Np from radioactive wastes. Flow sheet development will be done	d. Development of separation methods for the recovery of Ru and Np from radioactive wastes. Flow sheet development will be done.	d. Flow sheet will be developed for their recovery from actual radioactive wastes.
		e. 177Lu-DOTMP for palliation of pain from cancer metastases. 177Lu-CHX-A''-DTPA-Rituximab (NHL) for treatment of Non HodghkinS Lymphoma.	e. Development, in vivo and in vitro investigation and preclinical study.	e. Clinical deployment and transfer of technology to BRIT as a regular product for commercial supply to users.
		f. Apply radiotracer technique to solve industrial/societal problems, such as	f.	f.
		(i) Flow modeling of cross flow trickle bed reactors, Flow rate measurements in large diameter-pipelines	(i) 75% will be completed by September 2018	(i) 100 % will be completed by March 2020
		(ii) Hydrological investigations in the Probable Palaeochannels in parts of Haryana, Rajasthan, Gujarat and Uttar Pradesh	(ii) Study will be completed	(ii) The final report and recommendations will be submitted
		(iii) Isotope fingerprinting of aquifer systems for sustainable management of deep ground water resources	(iii) Pre- monsoon and Post monsoon sampling and analysis will be carried out and preliminary report will be prepared.	(iii) Study will be completed and The final report will be submitted
		(iv) Radiotracer investigations for evaluation of disposal sites for dredged sediments for developments of new shipping channels at Kolkata Port and validation of numerical	(iv) 75 % will be completed by September 2018	(iv) 100 % will be completed by March 2020

Sl. No	Unit	Project / Activity	Physical target - September 2018	Physical target - March,2020
1	2	3	4	5
		models (2-3 investigations)		
20	BARC	**Setting up experimental test facilities for conducting performance studies for AHWR and PHWR 540/ 700MW** a) Experiments in Critical Facility with (Th-Pu) MOX pins(Pre-Project activities for AHWR) b) Full scale experimental demonstration of stability and thermal margins for AERB clearance as identified by AHWR Safety Review Committee. (c) Safety & Regulatory Support to PHWR/NPPs (i) Experimental study on large scale molten material coolant interaction for PHWR (ii) Experimental study on Channel heat up behaviour for 700 MWe PHWR. (iii) Two-phase natural circulation studies for PHWRs in FISBE-II (iv) Demonstration of RAPS/MAPS In-vessel retention in severe accident (v) Characterization of aerosol and fission product transport behaviour in the primary heat transport system	a) Re-experiment analysis Performing experiment with available (Th,Pu)MOX pin cluster. b) Experiments will be completed. (c) (i) Experimentation will be completed (ii) Experimental setup will be made ready for experimentation (iii) Two-phase natural circulation stability and PDHRS performance testing. (iv)Facilities will be built. (v)Containment source term behaviour studies in presence of CFVS	a) Perform more experiments with different types of fuel depending on the availability of fuel. b) AERB clearance to be obtained for construction (i)– (ii)Experimentation will be completed (iii) LOCA studies for PHWRs in FISBE-II (iv)Experiments shall be completed. (v)Setting up of National Aerosol Facility, Aerosol studies in PHT system

Sl. No	Unit	Project / Activity	Physical target - September 2018	Physical target - March,2020
1	2	3	4	5
		and containment. (vi) Simulation studies on passive containment isolation system and validation with experimental data (d) Thorium Utilization & Production of U233: Developmental studies on molten fluoride salts, characterisation and component development (e) Instrumentation for Advanced Reactor Systems Development of two-phase sensors and Instrumentation measurement Systems	(vi)Completion of theoretical studies (d) Design of facilities for molten fluoride salt preparation, purification, characterisation, components and their test beds and their fabrication and procurement. (e) Development of WMS for void distribution and Sensors for dry out studies and Experimentation	(vi)— (d) Completion of fabrication, assembly and initiation of experiments. (e) Experimentation at high temperature steam-water and data analysis
21	BARC	**Hydrogen Production technologies** a) Fabrication of CHTR stage-1 experimental facility b) Procurement and fabrication of facilities [FIGO] for investigation of graphite oxidation c) Procurement and fabrication of facilities for testing of control and shutdown systems for CHTR [TICONS] d) Physics design & analysis for 20 MW IHTR e) Design of 20 MWth Innovative High Temperature Reactor (IHTR)	a) Completion of fabrication b) Setting up the facilities c) Completion of fabrication and procurement d) Basic reactor physics core configuration, fuel inventory studies e) Reactor physics and thermal hydraulic design, conceptual design	a) Installation and initiation of experiments b) Experiments for graphite oxidation studies c) Installation, commissioning and experiments d) Optimization of core parameters, Initial safety analysis e) Design reports and identification of R&D areas.

Sl. No	Unit	Project / Activity	Physical target - September 2018	Physical target - March,2020
1	2	3	4	5
			of reactor systems	
		f) Component level, thermal hydraulic CFD Analysis for containment safety systems (re-combiner, spray, fire, aircraft impact) and interaction of safety systems like re-combiner and spray.	(f) (i) Commissioning of Spray system at CSF (ii) Salt-water experimentation (iii)Re-combiner ignition characterization: commissioning of experimental facility (iv) Cloud combustion experimental facility commissioning and experiments.	(f) (i) Design analysis, performance evaluation and experiments with spray and venturi scrubber system. (ii) Qualification, performance enhancement and ignition characterization experiments (iii) Experiments on interaction of a horizontal jet with a stratified environment (iv) Pulse load experiments in multi-compartment, modelling and validation.
22	BARC	**Development for Solar Energy Technologies** a) Development of solar Heat concentrator, heat transport circuit and heat storage of a Solar-Hydrogen system. b) Design of systems for manufacturing of variable conductance heat pipe and initiation of procurement activity [HEPIMS].	a. Completion of major component developments. b. Fabrication and assembly	a) Demonstration of a complete integrated system by Mar 2019. b) Demonstration
23	BARC	**Infrastructure development at BARC, Vizag campus** a. Civil construction works of Technical laboratory (TL) – 04. **b.** Civil construction works of Technical laboratory (TL) – 10. **c.** Civil construction works of Utility Centre (UC) -01.	a. 75% Work will be completed b. 90% Work will be completed c. 80% Work will be completed	a. 100% Work will be completed. b. 100% Work will be completed. c. 100% Work will be completed.

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		d. Civil construction works of Utility Centre (UC) -02.	d. 90% Work will be completed	d. 100% Work will be completed.
24	BRIT	Technology demonstration and product development for radiopharmaceutical applications **Fission Molybdenum :** Designed document of plant machinery / equipment for production of fission moly will be ready. 15% advance payment will be released.	Civil/Electrical work will be completed. Equipments for Fission Moly Project will be received and cold commissioning will be completed.	Completion of the project and start of Fission Moly production for indigenous medical diagnostic column generators for hospitals and also supply of fission moly to other users
25	BRIT	**Radiation Technology Equipment :** Civil / Electrical will be completed 80% Order will be finalized for I-125 Seeds Manufacturing Plant. High capacity Ir-192 radiography camera will be developed.	Civil construction and electrical work for I-125 Seeds Manufacturing Plant will be completed. I-125 Seeds Manufacturing Plant will be supplied. Radiography camera of high activity will be developed	Production and supply of advanced radiation technology equipment to institutions & start of production and supply of Prostate cancer seeds to hospitals. Completion of expansion of RAPPCOF Project

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26	BRIT	**Facilities for radiopharmaceuticals production :** mIBG production plant will be supplied. Civil construction will be completed 70% Freeze drying unit will be procured.	Civil construction and electrical work will be completed. Major instrument/equipment for QA/QC and production will be procured. mIBG plant will be commissioned. RPL production lab will be renovated.	Commissioning of facilities and start of production and supplies of new radio-pharmaceuticals based on Lu177, Y-90 etc.
27	HWB	Production of Heavy Water & Setting up a New Heavy Water Production Plant	(a) Production of 610 MT of Heavy Water which is a vital input for revised PHWR programme. (b) Revival of Tuticorin Plant. Issue of work order for cooling tower and overhauling of equipment. (c) Obtaining financial sanction for the proposed new Heavy Water Plant.	(a) Production of 1320 MT of Heavy Water which is a vital input for revised PHWR programme. (b) Regular operation of the plant for heavy water production. (c) Issue of work order for civil and structural works for new Heavy Water Plant.
28	HWB	Production of Nuclear Solvents (D2EHPA / TBP) & enriched Boron	(a) Providing 250 MT of nuclear solvents for front end and back end fuel cycle activities for meeting the entire requirement of revised INPP. (b) Providing 50 Kgs of enriched Boron to meet revised FBR programme	(a) Providing 500 MT of nuclear solvents for front end and back end fuel cycle activities for meeting the entire requirement of revised INPP. (b) Providing 100 Kgs of enriched Boron to meet revised FBR programme
29	HWB	Setting up of Industrial facilities for production of sodium & facilities for production of new Solvents	**Sodium Production** : Obtaining financial sanction **Solvent Production** : Physical completion of the plant	**Sodium Production** : Mechanical completion of Sodium Production Plant **Solvent Production** : Regular operation of solvent production plant.

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30	HWB	Infrastructure development at HWP Sites	(a) Renovation of colony quarters (b) Acquisition process of Guest House at Kota &Bhubaneshwar (c) Acquisition / renovation process for infrastructure development for CISF	(a) Completion of renovation of colony quarters. (b) Possession of Guest House at Kota &Bhubaneshwar (c) Completion of infrastructure development for CISF
31	IGCAR	**Fast Reactor Technology Development**	i) Development of high flow Annular Linear Induction Pump (350m3/h). Completion of conceptual design. Completion of fabrication drawings. ii) Development of core flowering measurement system Mechanical design of CFMS mechanism. Design of electronics/instrumentation system. Development/Procurement of ultrasonic sensors and electronics iii)Design and setting up of Sodium Technology Complex for testing large size reactor components Design of Sodium Technology Complex for testing large size reactor components	i) Development of high flow Annular Linear Induction Pump (350m3/h). a) Initiation of procurement action and manufacturing of pump. ii) Development of core flowering measurement system a) Fabrication/machining of the device b) Assembly and functional testing of CFMS in air and water iii)Design and setting up of Sodium Technology Complex for testing large size reactor components Setting up of Sodium Technology Complex for testing large size reactor components
32	IGCAR	**Reactor facilities**	i) Up gradation in station computers, RAAMS & controls system ii) Fabrication of Control Rods iii) Strengthening and refurbishing of Civil structures of FBTR iv) Partial of Upgradation of Electrical & Mechanical systems of FBTR	i) Fabrication of Control Rod Drive Mechanism lower parts ii) Revamping of Dismantling cell iii) Completion of Upgradation of Electrical & Mechanical systems of FBTR &Kamini reactors iv) Refurbishing of Interim Fuel

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			&Kamini reactors v) Procurement action of seismically qualified Diesel Generator sets	Storage Building in which assembling/storing of PFBR assemblies is done v) Installation & commissioning of seismically qualified Diesel Generator sets vi) Fabrication of alternate fuel (EU silicide) for KAMINI reactor (by BARC)
33	IGCAR	**R&D on future FBRs**	i) Finalization of conceptual design report with feedback inputs from utility ii) Layout finalization for twin unit design	iii) Design & detailed engineering of components / systems iv) Phase-I PSAR documents preparation
34	IGCAR	**Fast Reactor Fuel Reprocessing**	i) Completion of construction, Commissioning & Operation of DFRP Phase – I ii) Relicensing of CORAL for FBTR fuel reprocessing Beyond 14 SAs iii) Regular operation of CORAL for FBTR fuels	i) Construction of Head End Facility (HEF) ii) Regular operation of CORAL for FBTR fuels iii) Development of equipment for future reprocessing plants iv) Development of process steps/processes for reprocessing, including metal fuel cycle
35	IGCAR	**Development of Inspection technologies, remote-handling and in-service inspection devices for FBR** PFBR MV/SV and SG inspection devices Construction of mock-up facility	i) Development of sensors and techniques for automated non-destructive inspection and imaging of components	(i) Development of ultrasonic NDE methodologies for inspection of FBR components submerged in sodium (ii) Development of high-sensitive NDE technologies for inspection of heat exchanger tubes (iii) Commissioning of in-service inspection device for inspection of

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		Automated and advanced NDE techniques		dissimilar weld of main vessel and roof slab of PFBR (iv)Development of Mark-II version of PFBR Steam Generator Inspection Device
36	IGCAR	**Materials, Fabrication & Inspection technologies and in-reactor materials evaluation** a) PIE of FBTR irradiated fuels & structural components Low-dose irradiation effects in austenitic SS PIE of nat.U-Zr metallic fuel pins Augmentation of RML hot-cells for handling metallic fuel pins Irradiation capsules for out-of-pile and in-pile experiments b) Indigenous materials and manufacturing technologies for in-core, reactor structural and steam generator applications Materials development (IFAC-1, 316LN and Boron added 9Cr-1Mo Steel) and property evaluation Processing and fabrication	i) Performance assessment of ferroboron irradiation capsule ii) Microstructural and impact property analysis of low dose irradiated SS316LN & SS304LN base and weld metals iii) Commissioning of facility for fabrication of irradiation capsule with fresh nuclear pins. iv) Procedure development for welding of end plug with IFAC 1 clad tube for fuel pin fabrication v) Generation of data on sensitization, intergranular corrosion and pitting corrosion for high nitrogen 316LN stainless steel weldments. vi) Completion of erection and testing of HTER in containment box. vii) Completion of fabrication by supplier, receipt, installation and testing of AVDMS (Automated Vacuum Distillation & Melting System) at IGCAR. viii) Completion of erection of Argon pressure control system (APCS) and related gas systems. ix) PO placement and fabrication of salt handling glove box x) Receipt and installation of servo	i. Examination of irradiated NatU-6Zr metallic fuel pins ii. (ii) Commissioning of Ph I lead cells for microstructural examination of metal fuel pin sections iii. Construction of Ph II shielded facilities for irradiated material characterization iv)Development of high-sensitive NDE techniques and sensors for quality assurance and PIE of metallic fuel pins iv. Generation of materials property data on 316LN, IFAC-1, Boron Added modified 9Cr-1Mo steel and establishing microstructure property correlation for these materials v. Demonstrating feasibility of producing 12-14%Cr ODS clad tubes vi. Procedure development for A-TIG welding of austenitic stainless steel pipes for

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		technologies Microstructural engineering of structural materials Corrosion control and monitoring technologies for reactor and reprocessing applications c) Development of Pyroprocessing flow sheet for metal alloy fuels	manipulator. xi) Completion of civil works around PPRDF-1 building xii) Obtaining commissioning clearance from AERB. xiii) Commissioning and operation of ARPS. xiv) Clearing of BEP area, disposal of resins and BEP equipments.	application in future FBRs vii. Demonstration of feasibility for producing steam generator tubes using boron containing modified 9Cr-1Mo steel. viii. Development of advanced materials, coatings, testing, and monitoring technologies for reprocessing plants ix. Development for corrosion detection and condition monitoring. x. Receipt and erection of salt handling glove box. xi. Trial runs of salt purification system xii. Completion of preparation of electrolyte salts for experiments. xiii. Containment box purity achievement for salt handling xiv. Commencement of electrorefining of U metal in HTER xv. Completion of erection of PPRDF-2 structure and containment box xvi. Completion of fabrication of ADDS (Actinide Draw Down System) and ZC (Zeolite Column) components

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37	NFC	Modernisation and Augmentation of Fuel Fabrication Facilities & Fuel Tube Manufacturing Facilities (MAZ4F) and	Overall physical progress will be 70 %.(MAZ4F)	100% completion of physical progress of the project.
		Melting and extrusion facilities (MEF)	Overall physical progress will be 75 %. for (MEF)	Completion of the project leading to enhanced extrusion facility, Zircaloy ingot production facility, zircaloy scrap cleaning facility and increased productivity and safety.(For MEF)
38	NFC	Modernisation and Augmentation of Manufacturing Facilities of Reactivity Mechanism Assemblies, Fuel Components and Tool Room (RMAFCTR)	Overall physical progress will be 75 %.	Completion of the project leading to enhanced Bar production, Sheet production & Reactivity Mechanism Assemblies per year and enhanced annual tooling requirement.
39	NFC	Revamping and Modernisation of Zirconium Production Facility (RMZPF)	Overall physical progress will be 80%.	Completion of the project leading to enhanced productivity and safety of zirconium production plants due to modernization and creation of facility for production of zirconium sponge for coolant tubes from Zr-Nb scrap.
40	NFC	Revamping and Augmentation of SSTP (RASSTP)	Overall physical progress will be 95 %.	Completion of the project leading to augmented facility for manufacture of Steam Generator tubes per year for the PHWR Programme. Manufacturing of 30m long 9Cr-1Mo SG tubes for future fast breeder reactors can also be done.

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41	NFC	Magnesium Recycling Technology Development and Demonstration Facility (MRTDDF)	Overall physical progress will be 50%.	Completion of the project.
42	NFC	Augmentation of Waste Management Facilities (AWMF)	Overall physical progress will be 60 %.	Completion of the project leading to augmented waste management facilities.
43	NFC	Augmentation of Security, Infrastructural Facilities and Electrical Systems (ASIES)	Overall physical progress will be 85%.	Completion of the project leading to augmented Security and Infrastructural Facilities at NFC, Hyderabad and creation of facilities for meeting the enhanced power requirements of various plants at NFC, Hyderabad.
44	NFC	Renovation and Augmentation of Utility, IT & Communication Facilities (RAUITC)	Completion of project leading to creation of facilities for meeting the existing and enhanced utility, IT & communication requirements at NFC, Hyderabad.	Nil.
45	NFC	Upgradation of Quality Assurance Facilities (UQAF)	Overall physical progress will be 85 %.	Completion of the project leading to augmented QA facilities and enhanced productivity in Quality Assurance.
46	NFC	NFC-Kota	Overall physical progress will be 40 %.	Completion of Plant & non plant buildings and receipt of major equipment (overall physical progress of 75% will be achieved).

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47	RRCAT	Indus-2 Accelerator & Indus Synchrotron User Facility	a) The new injector microtron will be installed in Indus and commissioned. b). The fourth insertion device, a super-conducting wavelength shifter, will be installed and commissioned in the Indus-2 storage ring. c). An RF amplifier module capable of delivering power up to 650 W, with phase and amplitude stability better than ± 0.1^{o}. and ±0.1% respectively, will be developed. d). High power ferrite circulators at 505.8 MHz will be developed for RF systems of	a) The fifth insertion device, a super conducting multipole wiggler, will be installed and commissioned in the Indus-2 storage ring. b). Electron beam position stability within ±30 micron (long term) and ±12 micron (short term) in Indus-2 storage ring will be achieved in the presence of the three insertion devices (undulators) and their beamlines. This will provide users with synchrotron radiation beam of desired stability. To meet this objective, beam based alignment system and feedback correction systems for Indus-2 will be completed and deployed for regular operation. Furthermore, the harmonic sextupole magnets along with their power supplies and controls will be deployed. These will ensure that the electron beam passes through the magnetic centre of the quadrupole magnets and compensate for beam degradation arising from imperfections in the fourth and fifth insertion devices in the Indus-2 storage ring. c). Solid state amplifiers will be developed for the pre-buncher and buncher systems, along with the microwave RF controls and feedback systems for the injector linac. d). A prototype of a transmission line kicker magnet with flat top better than 0.3%, and an eddy current septum magnet with stray

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			Indus-2 e). Front ends for two insertion device based beamlines will be installed and commissioned. These will facilitate installation of the beamlines BL-15 and BL-25.	field less than 0.1 Gm, will be made. e). A prototype of a DC magnet power supply (300 A) with current stability better than ±10 ppm with corresponding ± 2 to ± 5 ppm stability in control reference, will be made. f). A prototype of beam position monitor vacuum chamber with sub-micron resolution, will be developed. g). X-ray Magnetic Circular Dichroism beamline based on APPLE-2 undulator will be installed and commissioned. This beamline will be used for study of thin films and magnetic materials.
48	RRCAT	Superconducting RF Cavities for Proton Accelerator & High power RF sources for accelerators	a). Processing, and cryogenic testing of a 5-cell 650 MHz cavity will be carried out. b) RF amplifier integration and prototype testing of 100 kW, 325 MHz pulsed solid state RF amplifier will be completed by June 2017.	a). A 50 keV, 10 mA, pulsed H^- ion source and one RFQ structure with its associated RF systems, will be developed.
49	RRCAT	Agricultural Radiation Processing Facility (ARPF)	The indigenously developed travelling wave electron linear accelerator will be operated at a mean beam energy of 9 MeV and a beam power of 5 kW.	Electron beam radiation processing of agricultural and food products with a capacity of 5 kGy.ton/hour will be demonstrated.

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50	RRCAT	Free Electron Lasers, Solid State Lasers and Biomedical Applications of Lasers	a). One IR-FEL beamline for users will be commissioned. THz spectroscopic measurements on test samples will be done in low temperature and high magnetic field. b). Development of the flash lamp pumped, Q-switched, 4J Nd:YAG laser system will be completed. c). Honeycomb shaped orifices will be fabricated using Laser Additive Manufacturing technique for liquid sodium flow control for IGCAR Kalpakkam. d) A hyper-spectral synchronous fluorescence imaging system will be developed for analysis of biological samples and food stuff. e). Optical spectroscopic techniques will be developed for analysis of body fluids for detection of disease like cancer. f) An optical spectroscopy based system will be made for detection of adulteration in packaged milk products.	a). The IR-FEL will be upgraded to get a higher average power of 60 mW. Experiments will be carried out on selected magnetic and super conducting materials using lab based and FEL based THz/ IR spectroscopy setups. b). A 1 kW Yb-doped CW fiber laser will be developed. c). A 1.5 kW average power flash lamp pumped Nd:YAG laser will be developed. d). A narrow line width (less than 5 MHz) green laser will be developed. e). Micro channel heat exchangers for super critical CO_2 based Brayton Cycle power conversion system, will be made for RED, BARC, using Laser Additive Manufacturing. f). Depth-sensitive optical spectroscopy based portable instrument will be developed for non-invasive screening of oral cancer.

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				g). Development of optical spectroscopy/ imaging based system for identification of the presence of pesticides/ insecticides in food. h) An optical polarimetry system will be developed for three dimensional imaging of birefringent micro-structures in biological samples.
51	RRCAT	High Power Lasers and Laser Plasma Interaction	(a) The indigenously developed Nd:glass rods will be used to replace all the imported laser rods upto 50 mm dia., in one arm of the high power laser chain.	(a) Acceleration of electrons upto an energy of 0.5 GeV will be achieved using ultra-short laser pulses
52	VECC	Heavy-ion acceleration in K130 Cyclotron	1.Acceleration of gaseous heavy ions and deliver it to the users for experiments.	1.Development of metal ions from volatile compounds (MIVOC) / sputtering techniques for the ECR for production of heavy ions from the ECR and deliver it to the users.
53	VECC	Commissioning of Medical Cyclotron	1. Foreclosure of contract with M/S. Merint LLC. 2. Fresh contract to be explored and be made with OEM M/S. IBA, Belgium for installation and commissioning. 3. Shifting of all equipment to MCP-Chakgaria site. 4. Installation of Medical Cyclotron to be started. 5. Procurement of 4^{th} and 5^{th} beam line components to be delivered at MCP-Chakgaria site.	1. Installation and commissioning of Medical cyclotron to be completed. 2. Trial beam runs for PET and SPECT isotopes to be completed. 3. Installation and commissioning of 4^{th} and 5^{th} beam lines to be completed. 4. Procurement of Iodine-123 facility to be initiated.

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54	VECC	Indigenous development of 10 kW Solid State RF amplifiers	1. 1kW solid-state RF amplifier module to be completed. 2. Low power combiner design to be completed. 3. Development of low power combiner to be completed. 4. Design of thermal management of solid-state RF amplifier module to be completed. 5. High power combiner design to be completed.	1. Development of high power combiner to be completed. 2. Assembly of multiple nos. of PCBs for 1kW solid-state amplifier module to be completed. 3. Production of multiple nos. of high power combiner to be completed. 4. Development of enclosure with proper thermal management of 10kW solid-state RF amplifier to be completed. 5. Production of multiple nos. of 1kW solid-state RF amplifier module to be completed 6. 10kW solid-state RF amplifier to be completed.

Targets in respect of PSUs and Aided Institutions

PSUs : It is proposed to maintain MoU prevailing in 2015-2016 in respect of NPCIL and BHAVINI

Aided Institutions : The Department shall enter into MoU with all the Aided Institutions.