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CENTRAL POWER RESEARCH INSTITUTE

ANNUAL REPORT 2017 - 18

www.cpri.in

FOREWORD

The performance of the Institute for the year 2017-18 was noteworthy in terms of achievement against the targets, establishment of a few important facilities, special tests carried out, services offered to Indian and Foreign clients, relations with stakeholders, landmark events etc.

During the year, Central Power Research Institute (CPRI) organized many National Conferences / Workshops. The details of some of them are given below:

- CPRI, Bhopal organized "National Conference on Latest Trends in Switchgear and Controlgear – Smart Technologies" on 23rd & 24th February 2018, at Bhopal.
- National Workshop on "Synchrophasor for real time monitoring of smart power systems", held at CPRI, Bangalore, on 23rd & 24th November 2017
- National Workshop on "Engineering trends for Health Assessment of power station and various process industries", held at TRC-CPRI, Koradi, on 10th November 2017.

CPRI has been fortunate to get large chunk of 12th Five Year Plan funding to the extent of Rs.1182.00 crores for the four major projects during 12th Plan. These projects are under implementation and in the coming 1-2 years projects would be completed and will pave way for upgrading CPRI test facilities to the global level and CPRI will be geared up for rendering research and testing services in the next decade. Important facilities proposed under these projects are:

- Additional Generators for HPL, Bangalore (2500 MVA to 7500 MVA)
- On-line short circuit test facility at UHVRL-CPRI, Hyderabad
- Modern Tower Testing Facility (upto 1200kV rating towers) at UHVRL-CPRI, Hyderabad
- Establishment of Regional Testing Laboratory at Nashik
- Relocation of TRC-CPRI, Nagpur
- Temperature rise test (40 kA) facility at High Power Laboratory-CPRI, Bangalore
- Enhancement of oil test facilities & Energy meter test facilities
- Smart Grid and Phasor Measurement Unit Laboratory

The performance of the Institute with regard to set parameters are all time high despite prevailing slump in the manufacturing sector. The total receipts for the year was Rs.191.05 crores compared to the last year's figure of Rs.183.85 crores achieved. The officers of CPRI have published / presented a total of 172 technical papers including 99 papers in the International Conferences & Journals. The events numbering 59 organized by CPRI under Conferences / Seminars / Workshops /

FOREWORD

Training Programmes will pave a long way in dissemination of research outcomes among the scientific community. The research projects undertaken at the Institute have resulted in filing of 6 patents during the year.

CPRI was awarded the prestigious Rajbhasha Keerthi Puraskaar - First for the Excellent work in the field of Official Language Implementation for offices in Region 'C' during the year 2016-2017. The award was presented by Hon`ble President of India, Shri Ram Nath Kovindji on the occasion of "Hindi Divas" held at Planery Hall, Vigyan Bhavan, New Delhi, on 14th September 2017 which was received by Shri V. S. Nandakumar, Director General of the Institute. The Institute was awarded this for the 8th time consecutively, which is also the 12th award won by CPRI so far.

CPRI is also in the process of establishing new Test Centres for Distribution Transformers and Energy Meters in its bid to provide testing services with better access to Electrical manufacturers and Power Utilities in various regions.

On the consultancy front, CPRI has been carrying out the largest number of Third Party Protection Audits for Torrent Power Ltd, M/s. SembCorp Gayatri Power Ltd, Sarni Power Generating Plants, NHPC Ltd, in a big way. The Institute is taking a lead in the Smart Grid area at the National Level through Smart Grid Task Force & National Forum on Smart Grid and also offering consultancy services to TSSPDCL (Telangana Utility), and Puducherry. In addition, CPRI is carrying out pollution mapping with reference to transmission system in Eastern & Southern regions.

CPRI aspires to be the best laboratory in the world and this would happen with the active & continued support of Ministry of Power, Governing Council and Employees of the Institute.

I look forward to continued good performance of CPRI during the coming years.

(V. S. Nandakumar)
Director General

Contents

The Members of CPRI Governing Council as on 31st March 2018

Shri Ajay Kumar Bhalla, IAS
President
Secretary to the Govt. of India
Ministry of Power, Shram Shakti Bhawan,
Rafi Marg, New Delhi - 110 001

Shri Ravindra Kumar Verma
Vice President
Chairperson (I/c.),
Central Electricity Authority
Sewa Bhawan, R. K. Puram, New Delhi – 110 066

MEMBERS

Smt. Shalini Prasad, IAS
Additional Secretary
Ministry of Power, Shram Shakti Bhawan,
Rafi Marg, New Delhi - 110 001

Shri Vivek Kumar Dewangan, IAS
Joint Secretary & F.A.
Ministry of Power, Shram Shakti Bhawan,
Rafi Marg, New Delhi - 110 001

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Economic Adviser
Ministry of Power, Shram Shakti Bhawan,
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Member (Power Systems),
Central Electricity Authority
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Shri Pankaj Batra
Member (Planning)
Central Electricity Authority
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Secretary
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Siri Fort, New Delhi - 110 049

Shri Gurdeep Singh
Chairman & Managing Director, NTPC Ltd.,
NTPC Bhawan, SCOPE Complex, 7, Institutional Area,
Lodhi Road, New Delhi - 110 003

Shri I S Jha
Chairman & Managing Director
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Shree Gopal Kabra
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Deputy Director & Professor
Deptt. of Electrical Engg.
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Shri Abhay Bakre
Director General
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Shri V. S. Nandakumar
Member - Secretary
Director General
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केन्द्रीय विद्युत अनुसंधान संस्थान
CENTRAL POWER RESEARCH INSTITUTE
बेंगलूर
BANGALORE
स्थापित 1960 ESTD 1960

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SECTION - 1

ORGANIZATIONAL SET-UP

ORGANIZATIONAL SET-UP

CPRI - An Overview

The Central Power Research Institute (CPRI) was established by the Government of India in 1960, both in Bangalore & Bhopal, with its Headquarters in Bangalore. The Institute was re-organised into an autonomous society in the year 1978 under the aegis of the Dept. of Power, Ministry of Energy, Government of India. The main objectives of setting up the Institute was for it to function as a National Power Research Organization for undertaking applied research in electrical power engineering, to innovate and develop new products, besides functioning as an independent national testing and certification authority for electrical equipment and components to ensure reliability in the power system.

Objectives of CPRI

Technical

- Function as a National Power Research Organization for undertaking and / or sponsoring research and development projects in the fields of generation, transmission, distribution and operation of electricity supply systems.
- Provide necessary centralized research and testing facilities for evaluation of electrical materials and performance of power equipment.
- Serve as a National Testing and Certification Authority for the purpose of certification of rating and performance to ensure availability of equipment of adequate quality for use under conditions prevalent in Indian Power Systems.
- Act as an apex body for initiating and co-ordinating the R&D in the field of electric power.
- Evolve criteria for standards of various equipment for operation under Indian conditions and effectively participate in formulation of national standard specifications.
- Identify problems in the areas of basic and oriented basic research and arrange such studies in national academic Institutions.
- Co-ordinate R&D activities in the various State Electricity Boards and maintain liaison with other Institutions engaged in research connected with power systems and / or power equipment.
- Collect information and maintain documentation in the field of power engineering and prepare, print and publish any paper, periodical or report in furtherance of the objects of the Society.
- Establish, maintain and manage laboratories, workshops and other facilities for furthering scientific and technological research and conduct experiments for exploiting the invention or discoveries to the cause of power development in the country.
- Enter into agreement with any enterprise or institutions or person or persons and provide funds to them to carry out research and development programme of the Society.

Financial

- Accept grants of money and other assistance from the Govt. of India and other sources, Indian or foreign or enter into any agreement with them with a view to promote the objectives of the Society provided that in respect of foreign resources prior approval of the Government of India is obtained.
- Acquire by gift or purchase or exchange or lease or hire or otherwise, howsoever, any lands, buildings situated in India, equipment and any other properties movable and or immovable for

the furtherance of the objectives of the Society and construct or alter any building which may be necessary for the Society.

- Sell or lease or transfer or exchange or mortgage or dispose of or otherwise deal with any properties whatever belongings of the Society, provided that prior approval in writing of the Central Government is obtained.
- Draw, make, accept, endorse and discount cheques, notes or other negotiable instruments.
- Invest the funds or money of the Society not immediately required in any securities or in such manner as from time to time to be determined by the Governing Council.

Administrative

- Establish and award research studentships, fellowships.
- Retain or employ professional or technical advisors, consultants or workers to further the object of the Society and to pay there of such honorarium, fees or remuneration as may be thought expedient.
- Negotiate and enter into contracts on behalf of the Society and vary or rescind such contracts.
- Create administrative, technical, ministerial and other posts under the Society and to make appointments thereto in accordance with the rules and regulations of the Society.
- Take appropriate measures for training and welfare of the employees.
- Make rules and regulations and bye-laws for the conduct of the affairs of the Society and to add, to amend, to vary or rescind them from time to time with the approval of the Government of India.
- Do all such other lawful acts, deeds or things as are incidental or conducive to the attainment of any of the above objects.
- Maintain a research and reference Library.

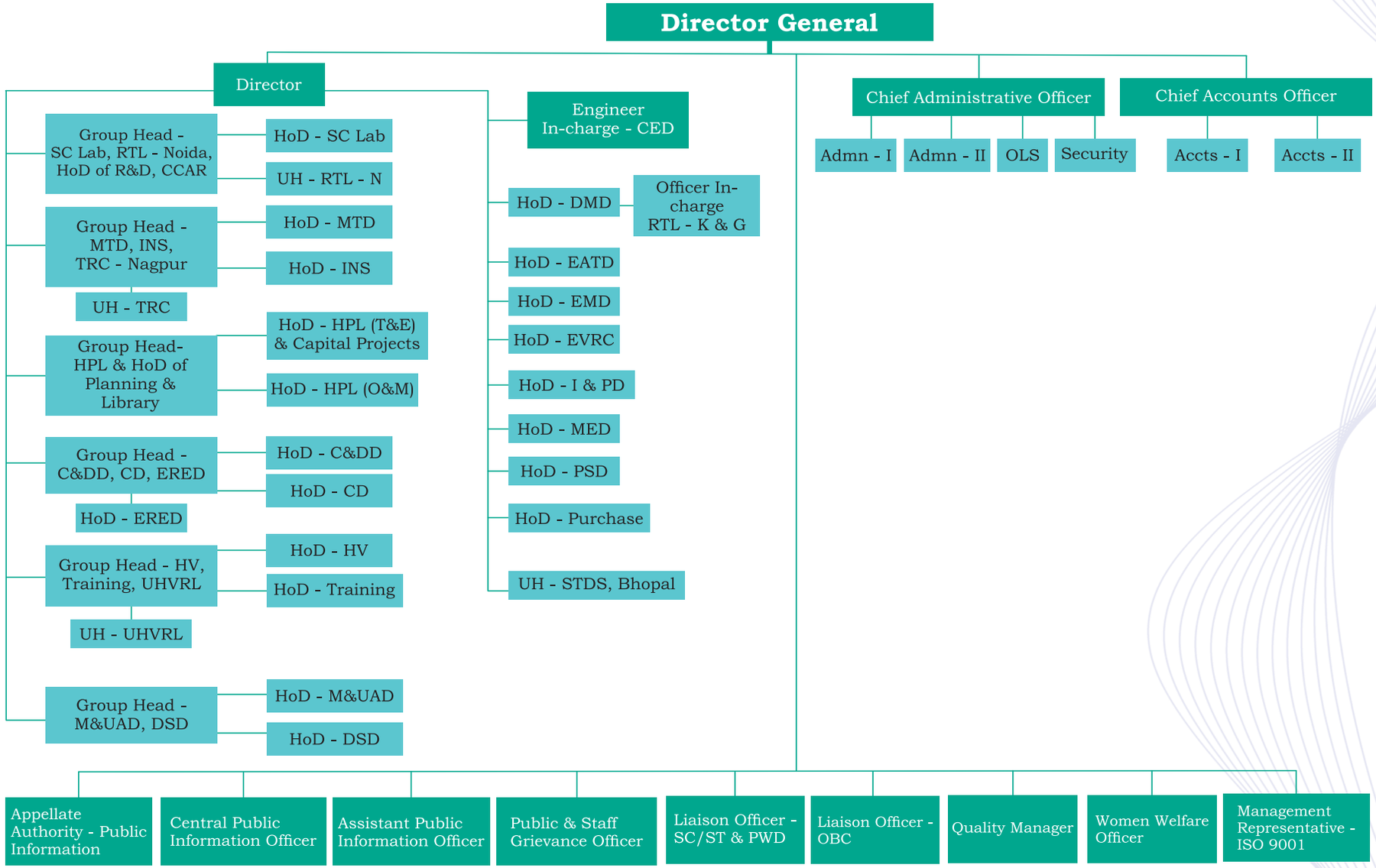
Management

The management of the institute vests in its Governing Council comprising members representing different Utilities, Ministries of the Government of India, Central Electricity Authority, State Electricity Boards, Power Supply Utilities, Indian Electrical & Electronics Manufacturers' Association, and various other academic and R&D organizations of national importance in the field of electric power engineering. The Secretary, Ministry of Power and Chairman, Central Electricity Authority act as the President and Vice-President of the Governing Council respectively, while the Director General of the institute acts as the Member-Secretary of the Governing Council.

A Standing Committee under the Chairmanship of Special Secretary/Additional Secretary, MoP with Member (Power Systems), Central Electricity Authority, Joint Secretary & Financial Adviser from the Ministry of Power and Joint Secretary looking after CPRI in MoP as Members and the Director General-CPRI as Member-Convener takes decisions on behalf of the Governing Council from time to time on administrative and financial matters. **The composition of this committee is described in Appendix - 1.**

The composition of Committee on Testing & Certification is given in the **Appendix-2.** The Committee takes decision on test tariff related activities. The Committee is chaired by Member (Power Systems), CEA.

ORGANISATIONAL CHART OF CPRI
As on 31st March 2018



CENTRAL POWER RESEARCH INSTITUTE
BANGALORE AND ITS UNITS

Central Research & Testing Laboratory (CRTL), Bangalore

Centre for Collaborative & Advanced Research (CCAR)

Established in 2006, this Centre works to facilitate and promote advanced research, there by helping the power sector to derive the benefits of latest technology.

The main objectives of the centre are to:

- Provide infrastructure for professionals to conduct research in power sector development.
- Create a conducive environment for collaborative research between R&D Institutions, Industry, and Academia.
- Execute projects based on multi-disciplinary expertise drawn from different Institutions.
- Disseminate expertise through continuing education initiatives and advanced Degree programmes.
- Foster healthy interaction and exchange of ideas between research organizations at a global level.

Cables & Diagnostics Division

This division has facilities for carrying out R&D work and also for evaluation of all types of cables, cable accessories, motor and transformer insulation and partial discharge measurement of HV equipment conforming to relevant national and international standards. Expertise is also available for Diagnostic, RLA and LE (Remaining Life Assessment & Life Extension) studies on electrical equipment and for detailed investigations of specific problems related to Research and Development in these areas.

Activities:

- Testing
- Consultancy
- Research & Development

Laboratories:

- Power Cables Laboratory
- Diagnostics Laboratory

600kV, 4200 kVA Outdoor Transformer

Power Cables Laboratory

Consultancy:

- Failure analysis of Power Cables and accessories like Joints/Terminations.
- Partial discharge measurements.

Research & Development Capabilities:

- Development of HV DC Cables.
- Any specific problem on Power Cables & accessories.

- Characterization of the unwanted fire by determining the various parameters like Rate of heat release, Rate of heat release per unit area, Mass loss rates Time-to ignition, Effective heat of combustion, Rates of release of toxic gas, Critical ignition flux.

Diagnostics Laboratory

The Laboratory has been rendering consultancy and field engineering services in the area of diagnostic testing of High Voltage substation and power plant electrical equipment.

The activity involves condition assessment of insulation system of the following substation/ power plant electrical equipment:

- Turbo Generators & associated electrical system
- Hydro generators & associated electrical system
- HV Motors
- Power Transformers & HV Bushings
- Switchyard equipments like CT's, CVT's, PT's, LA's
- Power Cables
- Resin cast CT's/PT's

The diagnostic field tests include the following:

Product/Apparatus &Tests:

HYDRO/TURBO GENERATORS

- Stator
- Rotor
- Power Transformers
- HV Motors
- Medium Voltage Power Cables
- EHV CTs/PTs and
- Resin cast CTs and PTs

R & D Capabilities:

The laboratory has experience & expertise to carry out detailed functional evaluation on various insulation systems like,

- Paper – oil insulation system
- Power Cable insulation system
- Rotating Machine insulation system
- Study on Static Electrification in large Power Transformers
- Investigations on Partial discharge and other diagnostic measuring techniques on Power equipment in service.

Partial Discharge test on 110 MW Turbo Generator

ELCID Test on Hydro Generator

- Frequency domain Diagnostic technique to evaluate the extent of insulation degradation in Power equipment in service (HV Dielectric Spectroscopy)

Power Capacitors Laboratory

Power Capacitors Laboratory of CPRI, Bangalore has established state-of-the-art facilities to cater to the requirements of Capacitor Manufacturers within the country and abroad. Research,Testing and Evaluation of Power Capacitors which have applications as shunt capacitors, series capacitors, surge protection capacitors, motor capacitors, fan capacitors, fluorescent capacitors are carried out as per National and International Standards. Also developmental tests as per Customers' requirement is conducted. Laboratory also has facilities for undertaking tests on filter reactors and series damping reactors associated with LV capacitors. The laboratory with the unique facilities is the first of its kind in this part of the world. Recently, facilities for testing LV APFC panels have been augmented including temperature rise test.

Testing of LV APFC Panels

Tests on LV APFC panels are carried out as per IEC 61921 and IEC 61439. The temperature rise test are carried out on APFC panels with all capacitor units, detuned/damping reactors, if any, and other components connected. Temperature rise test can also be carried out at elevated ambient temperature of 55 °C. The general ratings covered for testing are 3-phase 440 V APFC panels of output ratings 25 kvar, 75 kvar, 150 kvar, 200 kvar, 350 kvar, 375 kvar, 400 kvar, 450 kvar, 500 kvar, 800 kvar. Any other in-between ratings can also be tested.

Environmental tests

Environmental tests are carried out on various electrical and non electrical equipment / components / materials as per IEC 62271-100, IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-14, IEC 60068-2-30, IEC 60068-2-78, TEC-QM 333, etc.

Research and Consultancy

The Division is capable of undertaking R&D in the following areas:

1. Development of Indian Standard Specification for LV APFC Panels-Bureau of Indian Standards (BIS), New Delhi, Sponsored R&D project.
2. Study of switching transients associated with capacitor switching.
3. Investigation of PD Activity in Model Transformers – RC Project.
4. Selection of appropriate type of LV capacitors for LV distribution system.
5. Review of Specification for HV and LV capacitor banks
6. Root cause analysis of premature failure of capacitors
7. New product development
8. Consultancy and field engineering services for On-Line partial discharge measurement on power transformers in services.
9. Any specific problem of Power Capacitor Manufacturers, Utilities, Academic Institutions etc.

Dielectric Materials Division (DMD)

This Division has comprehensive evaluation facilities for insulating materials and systems. The insulating materials are evaluated and tested for electrical, mechanical, physical and electro- chemical and thermal properties.

This division has the following laboratories:

- Liquid Dielectrics Laboratory
- Polymer Laboratory
- Lubricating Oil Laboratory

The Division has developed several polymeric materials, namely epoxy novolok resin for insulators & electrical grade laminates and FRLS cables for critical safety applications. The Liquid Dielectric Laboratory has developed new techniques for dissolved gas analysis. Expertise in Furan analysis interprets the condition of solid insulation intransformers. It has also developed dielectric fluids based on Rapeseed oil.

The Polymer Laboratory has well-experienced technical personnel to advise the polymer industries on setting up plants, process improvement, etc. involved in R&D of polymeric insulators for electrical equipment. This division under takes consultancy work and sponsored projects for different power utilities and manufacturing companies.

The Lubricating Oil Laboratory has been setup to meet the quality assessment needs of industrial lubricating oils, turbine oils, etc.

Evaluation facilities like Cone Penetration, Drop Point, Oil Separation, Flash Point and Density are also available for Greases, Petroleum Jelly, Cable Filling & Flooding Compounds.

Degree of Polymerization (DP) evaluation facility for solid insulation in power transformers is also available.

Distribution Systems Division (DSD)

With state-of-the-art facilities and software tools, the Distribution Systems Division (DSD) of CPRI has been rendering research and consultancy services in finding solutions to various problems faced by the electrical industry in the area of power distribution.

The division has been rendering consultancy services to the Electricity Regulatory Commission in estimation of losses in distribution and finalization of tariff structure. CPRI has been involved in Flagship programmes namely, Accelerated Power Development & Reforms Programme (APDRP) erstwhile Rajiv Gandhi Grameen Vidyut Vikas Yojana (RGGVVY) & the present Deendayal Upadhyay Grameen Vidyut Yojana (DDUGVY) of Government of India and Integrated Power Development Scheme (IPDS) over the past several years. The activities of the RGGVVY as TPIA

consultant and R-APDRP as TPIEA consultant related works at CPRI are being coordinated by the Distribution System Division. Research Consultancy assignments as well as the SCADA and distribution reforms related works are taken up by this Division.

Electrical Appliances Technology Division (EATD)

Important activities of this Division include performance evaluation and certification on low - voltage equipment like switches, bulbs, and heaters, refrigerators, air-conditioners, battery etc.

The Laboratories operating under this division are:

- Domestic Electrical Appliances Laboratory
- Ingress Protection Laboratory
- Battery Testing Laboratory
- Illumination Laboratory
- Fan Testing Laboratory
- Refrigerator and Air Conditioner Testing Laboratory

Important activities of the division relate to check testing under the standards and labeling programme of the Bureau of Energy Efficiency.

Earthquake Engineering & Vibration Research Centre (EVRC)

This Division is equipped with facilities for providing testing, research and consultancy services in the area of seismic and vibration qualification of instruments/equipment for nuclear power plants and other generating stations as per national and international standards. In addition, this centre offers consultancy services in checking the design adequacy of Structures/Substations, Railways for seismic qualification.

The Division is equipped with a Triaxial shake table of 3m x 3m size and 10 ton pay load capacity for simulating earthquake vibrations. In addition, has Electrodynamic Shaker System for carrying vibration tests on products and assemblies.

Energy Efficiency & Renewable Energy Division (ERED)

This division undertakes studies and investigates problems pertaining to energy audit, energy conservation and field engineering services of power plants. This division also provides interdisciplinary field study packages to thermal power stations and process industries on remaining life estimation, renovation, modernization, and up-gradation and life extension of components, sub-systems and plants. The division is accredited by Bureau of Energy Efficiency (BEE) and Petroleum Conservation Research Association (PCRA) for conducting energy audit in power plants and other units.

The laboratory has facilities for evaluating and certifying the following:

- Solar Photovoltaic Lanterns & Pumps
- Compact Fluorescent Lamps and LEDs
- Solar Home Lighting and Street Controllers
- LED Lighting Systems
- Solar Photovoltaic Panels
- Grid Tied Inverters
- Motors

High Voltage Division (HVD)

This division has facilities for evaluating the performance and certifying high voltage electrical equipment and investigating the problems in the area of HV & EHV transmission of electric power.

The laboratory conducts performance evaluation of power equipments like Power Transformers, Potential Transformer, Air Break switches, Isolators, Cables, Bushings, Power Line Accessories, Lighting Arresters etc., up to 400 kV systems.

The following Laboratories operate under this Division:

- High Voltage Laboratory
- Pollution Laboratory
- Impulse Current Laboratory

High Power Laboratory (HPL)

This laboratory is unique in this part of Asia and helps in evaluation of EHV equipment installed in the major power transmission projects in the country.

This Laboratory is equipped with facilities for development, evaluation and certification of EHV Circuit Breakers, Power Transformers, Current Transformers, Isolators, Line (Wave) Traps, Reactors, Insulator Strings, etc. It caters, mainly to performance evaluation of the above equipments under short circuit and other switching conditions.

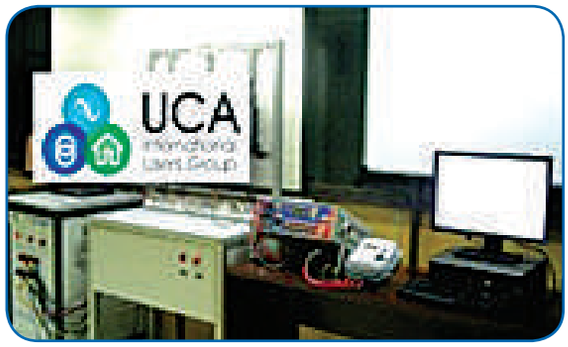
The facilities available in this Laboratory are as follows:

- Direct testing facility upto 2500 MVA, 72.5 kV, 3-Phase and 1400 MVA, 245 kV, SinglePhase
- Synthetic testing facility for extra High Voltage Circuit Breakers rated up to 400 kV, 63 kA

Metering & Utility Automation Division (MUAD)

This Laboratory undertakes Type Testing of Electro-Mechanical and Electronic meters of accuracy 0.2 to 2.0 as per national and international standards and also carries out performance evaluation based on Acceptance Test, Routine Test as per utility requirements. The Division has recently established facilities for evaluating smart meters.

The following Laboratories operate under this Division:



- Calibration Laboratory
- Energy Meter Testing Laboratory

The Division has established a Mobile Laboratory for calibration of energy meters at site and for helping Central Electricity Regulatory Commission, Delhi Electricity Regulatory Commission, etc.

The Division boasts of a unique state-of-the-art communication protocol laboratory with facility to test the energy meter and substation communication equipment as per the IEC/MODBUS/DNP protocol standards.

This division is the backbone of all Information Technology activities at CPRI, and is built with state-of-the-art dedicated servers that run on different platforms like Sun Solaris, SCO Unix, Linux and Windows. The Division also maintains NAS storage devices and takes care of the Internet services at CPRI.

Insulation Division

The Insulation Division has specialized facilities and expertise for testing and evaluation of Dielectric materials and to carry out accelerated ageing and corrosion resistance studies on Dielectric materials.

Laboratories under this Division are:

- Solid Dielectrics Laboratory
- Heat Run Test Laboratory

Solid Dielectrics Laboratory has comprehensive, testing and evaluation facilities for solid insulating materials and systems. Insulating materials are evaluated and tested for electrical, mechanical, physical and electro-chemical properties. This laboratory has undertaken consultancy work and sponsored projects for different power utilities and industries. Assistance has been rendered to BIS, in formulation of various standards on enamelled winding wires and insulating materials & systems.

Weathering using Xenon Arc Lamp

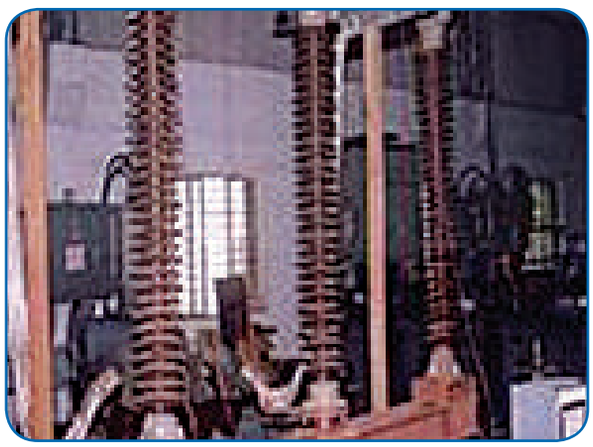
Cyclic Corrosion Test Equipment

Heat Run Test Laboratory has facility to carry out Temperature rise test on Distribution, Transmission & Power equipment and accessories as per relevant National & International Specifications.

Temperature Rise Test up to 6700 Amps, Milli volt drop & resistance tests (wherever applicable) from 1.0 micro ohms to 20 kilo ohms can be conducted on the following equipment, as per Indian (IS) IEC, ANSI of ASTA standards.

1. LT Panel

2. Isolated Phase Bus Duct



3. Isolator

Materials Technology Division (MTD)

This Division has the following Laboratories for evaluating and development of organic and inorganic materials;

- Materials Characterization and Engineering Laboratory
- Corrosion Laboratory
- Analytical Laboratory
- Fuel Analysis and Combustion Research Laboratory
- Power Station Technology and Field Engineering

Application Laboratory

This Division offers consultancy services to Power Plants in the areas of:

- Wear & Erosion and Mechanical Evaluation Facilities
- Remaining Life Assessment and Renovation & Modernization
- Industrial Solid Waste Utilization Centre

Mechanical Engineering Division (MED)

This Division is engaged in the study of the mechanical engineering problems faced by the transmission systems of electrical utilities. Apart from offering solutions to such problems, the Division helps the electrical utilities to achieve economy and reliability in their day-to-day operations. Consultancy services for evolving optimized tower design are also undertaken by the Design Cell of the Division. In addition, this Division has laboratories to conduct R&D work and also to provide evaluation facilities to the manufacturers of transmission towers, line components and accessories, vibration dampers, spacer/spacer dampers etc.

The Laboratories operating under this Division are:

- Proto type Tower Testing Station
- Model Tower Testing Laboratory
- Structural Materials Testing Laboratory
- Tower Foundation Testing Centre
- Vibration Laboratory
- Wake Simulation Laboratory

Power Systems Division (PSD)

This Division is involved in the study of various problems encountered by manufacturers and utilities in the design, installation and operation of electric power systems, using both mathematical and physical models.

The division has the following facilities:

- Power System Digital Simulation Centre
- Real Time Digital Simulator (RTDS)
- Relay Testing Laboratory

The Laboratory also offers consultancy on automation related to Substations, Distribution, SCADA, SMART GRID etc.,to all major utilities in the country. It also offers consultancy services in the area of Generation & Transmission system studies, Protection System studies, Performance evaluation of controllers etc.

PMUCAL PHASOR MEASUREMENT UNIT TESTING & CALIBRATION SYSTEM 6135A

The Fluke Calibration 6135A/PMUCAL Phasor Measurement Unit Calibration System is a measurement and calibration device used to:

- Calibrate and Test a PMU (Phasor Measurement Unit) as per IEEE C37.118.1-2011, IEEE C37.118.1a-2014 standards and IEEE Synchrophasor Measurement Test Suite specification -2015 (version 2) with the pre-loaded suite of required tests.
- Perform custom testing by simulating static and dynamic conditions that a PMU can experience in a power grid to verify operation in ways not specifically required by the standard.
- Modify and create new testing procedures as needed
- Analysis of Test Data and results

PMU CALIBRATOR

Short Circuit Laboratory (SCL)

This Laboratory has facilities to undertake evaluation, certification, and development of LT Switchgear, Fuse gear, and Power System Apparatus. Applied Research is also undertaken to lend a helping hand in the development of indigenous products.

Type tests and Routine tests on low voltage switchgears and controlgears, distribution transformers up to

1 MVA 11kV class and other power system apparatus can be undertaken in the Short Circuit Laboratory as per the relevant Indian Standards (IS) and International Specifications (IEC, BS, CSA, UL, ANSI, IEEE). The laboratory is accredited by Intertek-ASTA Certification Services that enables ASTA Certificates to be issued to the customers.

Training Division

The Training Division identifies the training needs of CPRI. The staff members are regularly deputed for project-specific training programs, organized in-house as well as through outside agencies.

The Training Division also organises customised training modules for engineers from utilities.

UNITS OF CPRI

Switchgear Testing & Development Station (STDS), Bhopal

The unit situated adjacent to the BHEL premises at Bhopal, the capital city of Madhya Pradesh, has two main testing stations for conducting Short Circuit tests. They are:

STATION I: Direct Short Circuit Test Station of 1250 MVA capacity at 12 kV capacity utilizing two specially designed 1500 MVA short circuit alternators, G1 of M/s Orlinkon make and G2 of M/s Alstom make. This station mainly caters to short circuit tests on high and Medium Voltage Switchgears, Transformers and other allied equipment.

STATION II: The On-lineTesting Station is drawing power upto 100 MVA from the MPSEB Grid from the Chambal Substation through 132 kV three single phase circuit. The fault level of 132 kV Busat Chambal Substation is 1900 MVA at 0.2 Power factor. This station mainly caters to Short Circuit tests on Low Voltage Switchgears, Transformers and other allied equipment.

The Laboratory provides facilities for evaluation and certification of EHV circuit breakers, power transformers, isolators, line(wave)traps, reactors, insulator strings etc., for performance evaluation under short circuit and other abnormal conditions. A 100 MVA on-line Evaluation Station is a special facility that enables evaluation and certification of LT and HV switchgear in addition to the1500 MVA short circuit alternator and Energy Meter Evaluation Laboratory. The unit also hosts a Transformer Oil Evaluation Laboratory to conduct in-service oil evaluation.

Prior to and subsequent to the short circuit tests, a variety of tests are to be conducted as stipulated by the standards. These are conducted at the following supplementary test Laboratories:

- Temperature Rise Test Laboratory.
- ELCB, MCB, MCCB, RCCB, Contactors and Fuse Test Laboratory.
- Ingress Protection Test Laboratory.
- High Voltage Laboratory (for dry/wet power frequency and lightning impulse).

- CT and PT Test Laboratory.
- Partial Discharge Laboratory.
- Mechanical and Electrical Endurance Test Laboratory: These facilities are in the process of continuous up-gradation to meet newer test requirements. These laboratories also conduct type tests, besides pre & post short circuit supplementary tests.

Other Facilities:

- EMI/EMC and Energy Meter Testing Laboratory
- Calibration Laboratory
- Transformer Oil Testing Laboratory
- EHV Laboratory

Regional Testing Laboratory (RTL), NOIDA

Regional Testing Laboratory, which was originally situated at Muradnagar, was shifted to Noida in order to provide better services to customers, in the year 2009.

The Laboratory was setup with a view to cater to the testing, certification and evaluation needs of electrical power equipment manufacturing industry. This unit acts as a liaison unit of CPRI with various customers in Northern Region and coordinate their test requirements which are beyond the scope of the Regional Laboratory but with in the capabilities of Bangalore and other units. Various Laboratories housed under this unit are:

- High Voltage Laboratory
- Liquid Dielectric Laboratory
- Cables Laboratory
- Diagnostics Laboratory
- Energy Meter Testing Laboratory

The important facilities under this Unit are Cables Evaluation Laboratory upto 33 kV rating, a High Voltage Laboratory for evaluation of insulators and transformers and a Transformer Oil Evaluation Laboratory. The Unit also hosts facilities for evaluation of energy meters and diagnostic evaluation of power equipment.

Thermal Research Centre (TRC), Nagpur

This Centre situated near Koradi Thermal Power Station, Koradi, is mainly intended for taking up consultancy and R&D work pertaining to Thermal Power Stations. The Centre is also equipped to take up consultancy work in the area of environmental impact assessment and investigations on fuel treatment, ignition studies, coal

characteristics, pilot scale studies for coal gasification, slurry fuels, life estimation of Thermal Power Plant components, renovation & modernization of thermal power plants, etc. This Centre undertakes remaining life assessment and renovation & modernization of Thermal Power Stations and has provided consultancy services to more than fifty Thermal Power Stations.

Ultra High Voltage Research Laboratory (UHVRL), Hyderabad

UHV Research Laboratory, Hyderabad was commissioned in 1993, with the following objectives:

- To provide design data valid for the country's particular climatic, environmental and operating conditions, for transmission system above 400 kV
- To provide necessary facilities for the development and testing of UHV Equipment

The above mentioned objectives are realized by the following facilities:

Experimental Line

An experimental transmission line of 720 m length, divided into central suspension span of 360 m and two dead end spans of 180 m each. There is facility to vary the conductor to tower clearance, conductor to conductor clearances and conductor to ground clearance. This facilitates the study of radio noise, audible noise, corona loss etc.

Mock-Up Tower

The purpose of the Mock-up Tower is to carry out air insulation studies, between conductor to tower and between conductor to conductor. This arrangement has provision to string two conductor bundles between two dead end towers at 80 m apart with a Mock–up Tower located in between.

Pollution Test Chamber

The Pollution Test Chamber is one of the largest in the world with a diameter of 24 m and a height of 27 m. Salt fog test can be conducted on insulators, bushings etc., up to 800 kV class.

Cascade Transformer

The Cascade Transformer, comprising two units rated 800 kV each (total rating is 1600 kV, 9600 kVA) is used for energizing the experimental line, pollution chamber and testing equipment. The equipment has an extension unit which can generate oscillating switching surge impulse of up to 2000 kV peak.

Impulse Generator

The Impulse Generator isused for switching impulse and lightning impulse tests on air gaps and equipment insulation. The impulse generator rating is 5 MV, and 500 kJ with 25 stages and a height of 23 m.

This Laboratory has the necessary infrastructure to simulate operating voltage conditions in the range of 220 kV to 1200 kV on an experimental line. It is used to evaluate the suitability and adaptability of UHV systems to Indian power systems taking into account the climatic, environmental, ecological and biological conditions prevailing in our country. The facility can evaluate corona loss, audible noise, radio and television interference, electric field etc., under various voltage and climatic conditions. Besides, the Laboratory has the capacity to cater to investigation and evaluation of equipment rated up to 1200 kV class. This is a 'one of its kind' facility in this part of the world.

± 1200 kV HVDC Test System

Central Power Research Institute (CPRI) has commissioned a new outdoor ± 1200 kV / 200 mA DC test system at UHV Research Laboratory, Hyderabad. This is a unique facility which was not available in India. The facility will help in conducting HVDC transmission line research as well as facilitate indigenous development & testing of equipment for the new HVDC transmission lines that are coming up in the country. The HVDC test system, shown in photograph, which is 18 meters in height, essentially comprises of two separate DC sources giving positive and negative polarity voltages respectively and can be operated individually or simultaneously at rated voltage and current in continuous mode. Each pole comprises of a two stage DC Generator with an integrated DC voltage measuring divider and earthing device.

A View of ± 1200 kV DC Test System

Regional Testing Laboratory (RTL), Kolkata

This was setup with a view to cater to the evaluation & certification needs of the electrical power equipment manufacturing companies, utilities and consumers in the eastern region. The laboratory is equipped with facilities to carry out evaluation of insulating oils in power transformers as per IS 1866-2000. The dissolved gas analysis of transformer oil in the

power transformers, an important diagnostic tool, is available at RTL, Kolkata for assessing the internal condition of the transformers.

The laboratory has evaluation facilities like High Performance Liquid Chromatography (HPLC) which is an important diagnostic tool for assessing solid insulation in power transformers to evaluate Furfural content (Furan Content). The facility is also being used for assessing the inhibitor level in the transformer oil. This unit also co-ordinates activities of oil laboratory located at Guwahati, providing services to the North Eastern parts of India.

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SECTION - 2

RESEARCH & DEVELOPMENT

RESEARCH & DEVELOPMENT

CPRI is the Coordinating Nodal Agency for selection, initiation, execution, review of Research and Development schemes in India under Ministry of Power (MoP). CPRI has been entrusted with the responsibility of administering the various Research Schemes sponsored by the Ministry of Power, as given below:

A. Projects under R&D Schemes of MoP being implemented through CPRI

   i. In-house Research Projects (IHRD)

   ii. Research Scheme on Power (RSoP) Projects

   iii. R&D Under National Perspective Plan (NPP)

      a. Project taken by CPRI

      b. Project under Uchhatar Avishkar Yojana (UAY)

      c. Project under Impacting Research Innovation and Technology (IMPRINT)

B. Sponsored Projects by other Ministry/ Department/ Institutions/Organizations etc.

Procedure for screening, review and approval of Project Proposals: CPRI has a comprehensive review and approval mechanism of the proposals received under the R&D Schemes to avoid any overlapping of research done under other schemes of Govt. of India. The proposals are first checked by the R&D Management Division for consistency of information and examined whether the research intent is in line with the Thrust Areas identified in the National Perspective Plan. The thrust areas of research for the next 3-4 years for the Indian Power Sector have been identified by a High Level Committee constituted under the Chairmanship of Secretary (P) for assessment and review of R&D activities of Organization/PSUs under the Ministry of Power. The proposals are then sent to two domain experts for review of the research content and to adjudge the technical feasibility. Based on the comments, the proposals are put up to a Technical Committee (TC) for techno-economic evaluation. At present there are four TCs on Hydro, Thermal, Transmission and Grid Distribution and Energy Conservation Research. The TCs are chaired by eminent Professors from IITs who are also associated with review and approval of research proposals under various sponsored research schemes of Govt. of India. The proposals recommended by the TC are put up for consideration of the Standing Committee on Research and Development (SCRD). The SCRD is chaired by Chairperson, Central Electricity Authority, New Delhi and has representations from Academia, Industry and other Ministries. The representation of other Ministries in the SCRD ensures that overlapping of research under the proposed scheme can be avoided.

The Apex Committee of IMPRINT chaired by Secretary (Higher Education), MHRD and with members from the participating Ministries has been constituted for approval of the proposals and monitoring the progress of implementation. The Apex Committee has the authority for financial sanction and financial closure of the projects. The National Co-ordinator for IMPRINT viz. IIT Kanpur is responsible for convening the Apex Committee meetings.

IIT-Madras is the National Co-ordinator for implementation of the UAY scheme. Monitoring of the progress of projects under the UAY Scheme is done by an inter-ministerial committee constituted for this purpose.

Administering of R&D Projects

The Apex Committee on R&D namely Standing Committee on R&D (SCRD) is headed by Chairperson, CEA and the composition of the Committee is given in Appendix-3. The Standing Committee on R&D (SCRD) is the apex body that evaluates the research projects and also monitors implementation of the scheme objectives.

Four Technical Committees have been duly constituted to administer the R&D Projects in the areas of Thermal, Hydro, Transmission, Grid, Distribution and Energy Conservation. The composition of Committees are given in Appendix-4 to 7. The four Technical Committees assist SCRD by closely monitoring and steering the projects to successful completion.

Funding Mechanism:

Projects approved under the RSoP and IHRD schemes are fully funded by the MoP. However, in case of projects taken up by the Industries under the R&D under NPP Scheme the project cost is shared by the concerned Industry and the MoP on 50:50 basis.

For projects approved under the UAY Scheme, half of the project cost is funded by the Ministry of Human Resource Development (MHRD), 25% is borne by the MoP.

For Projects approved under 'Energy' domain of IMPRINT Scheme, the cost of funding the projects is shared equally between MHRD and the MoP. Thus, funding support to the extent of 50% is extended by the MoP.

Project Monitoring:

Quarterly Progress Reports and Utilization Certificates are submitted by the project implementing organization to the R&D Management Division of CPRI. Further, the Four Technical Committees and the SCRD meet from time to time to monitor the progress of the on-going projects.

During the 12th Five Year Plan, CPRI has funded 20 projects under the "R&D under NPP" scheme, 38 projects under RSoP scheme and 32 projects under IHRD Scheme. Some of the projects aim at design and development of indigenous technologies with the objective of cost reduction, import substitution and employment generation. The deliverables of the projects will not only help in development of innovative solutions thereby adding to the knowledge capital on the particular priority area but also acts as prior art for the future researchers. Three (03) patent applications have been filed during FY 2017-18 based on the outcome of three R&D projects.

In-House Research Projects (IHRD)

In-house research projects (IHRD) serve to develop technology and expertise to cater to the future needs of the Indian power industry. These projects are proposed by scientists and engineers of CPRI after careful analysis of the current technological requirements and conditions prevailing in the Indian Power Sector. The projects proposed by the scientists and engineers are recommended by the Technical Committee on Transmission, Grid, Distribution and Energy Conservation, Hydro and Thermal Research and then approved by Standing Committee on R&D (SCRD).

For the year 2017-18, following is the summary of the ongoing In-house Research Projects at CPRI:

Sl. No.	Project Title	Division	Outlay (Rs. in lakhs)	Duration
1.	Smart Inverter with E meter and IOT	Metering & Utility Automation Division, CPRI, Bangalore	46.80	2 Years
2.	Assessment of low cycle thermal fatigue damage in steam turbine during transient	Thermal Research Centre, CPRI, Nagpur	50.00	2 years
3.	A reliable optimal smart metering infrastructure for smart Grid	Power Systems Division, CPRI, Bangalore	70.00	2 years
4.	A Novel Optoelectronic Technique for Online Partial Discharge Monitoring of Transformers	Cables & Diagnostics Division, CPRI, Bangalore	36.00	2 years
5.	Studies to Establish Critical Resistive Leakage Current of Gapless ZnO Polymeric Surge Arresters for In-service Failure Prediction	High Voltage Division, CPRI, Bangalore	21.50	2 years
6.	A Laboratory Investigation for standardization of Testing Method for Pollution Performance of Polymer Insulators	High Voltage Division, CPRI, Bangalore	20.90	2 years
7.	Assessment of Pollution level and Design of External Insulation for High Voltage Transmission System	High Voltage Division, CPRI, Bangalore	11.50	2 years
8.	Wide Area Measurement System (WAMS) based Fault Signature Analysis for fault detection and location assessment using measurements from Phasor Measurement Units (PMUs)	Power Systems Division, CPRI, Bangalore	49.35	3 Years
9.	Effect of harmonic due to large scale penetration of Rooftop SPV Power Plant	Distribution Systems Division, CPRI, Bangalore	20.00	2 years

Sl. No.	Project Title	Division	Outlay (Rs. in lakhs)	Duration
10.	Design and Development of 10 kA 1000 V Synchronized Static switch for Evaluation of Breaking Performance of Miniature Circuit Breaker (MCB)	Short Circuit Laboratory, CPRI, Bangalore	20.00	1 ½ years
11.	Evaluation of the co-firing characteristics of Alternative Fuels mixed with high ash Indian coals for power generation applications	Materials Technology Division, CPRI, Bangalore	33.00	2 years
12.	A study on the effect of nanoparticles on the critical parameters of insulating fluids	Dielectric Materials Division, CPRI, Bangalore	20.00	2 years
13.	Development of flame retardant polymer composites for insulating applications	Dielectric Materials Division, CPRI, Bangalore	17.00	2 years
14.	Dielectric nano-composites for capacitors applications	Dielectric Materials Division, CPRI, Bangalore	44.50	2 years
15.	Development of LDPE, MDPE and HDPE Nano-composite for DC Cable Application	Cables &Diagnostics Division, CPRI, Bangalore	105.00	2 years
16.	Development and Demonstration of an Adaptive Protection Scheme for Distribution Systems under High Penetration of Distributed Energy Resources	Power Systems Division, CPRI, Bangalore	72.38	2 years
17.	Study of AC Corona Phenomena and power loss for 1200 kV conductors and characterization of corona discharges from line / substation components	UHV Research Laboratory, CPRI, Hyderabad	132.00	2 years
18.	Study of Electric Field Environment of HVDC Transmission Lines	UHV Research Laboratory, CPRI, Hyderabad	114.00	3 years
19.	A study on online partial discharge measurement of power cables using inductive couplers and noise elimination by wavelet technique	Cables & Diagnostics Division, CPRI, Bangalore	92.00	3 years

Sl. No.	Project Title	Division	Outlay (Rs. in lakhs)	Duration
20.	Evaluation of re-ignition circuit by replacing the air gap with vacuum interrupter bottles	High Power Laboratory, CPRI, Bangalore	105.00	2 years
21.	Development and demonstration of ultra-capacitors and lead-acid batteries based hybrid storage for a 5 kW solar- powered micro-grid	Capacitors Division, CPRI, Bangalore	49.50	2 years
22.	Development of gasification reactor system for conversion of multi fuel to syngas	Materials Technology Division, CPRI, Bangalore	91.00	2 years
23.	Development and demonstration of 1 kW soluble lead redox flow battery system for solar energy and retrieval	Electrical Appliances Technology Division, CPRI, Bangalore	77.00	2 years
24.	Run-of-the-River low head micro hydroelectric system for off-grid microgrid operation	Materials Technology Division, CPRI, Bangalore	93.50	2 years
25.	Smart Transmission through Wide Area Measurement System to control and co-ordinate HVDC/ FACTS devices	Power Systems Division, CPRI, Bangalore	110.00	2 years

Research Scheme on Power (RSoP) Projects

The project proposals are invited from academia, power utilities, and research institutes. The projects proposed by the scientists and engineers are recommended by the Technical Committee on Transmission, Grid, Distribution and Energy Conservation, Hydro and Thermal Research and then approved by Standing Committee on R&D (SCRD), for projects above Rs. 50 Lakhs and by Director General, CPRI for projects with outlay upto Rs. 50 Lakhs.

For the year 2017-2018, the following is the summary of the ongoing RSoP projects:

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
1.	Use of Synchorphasors in Power System Load Modelling and State Estimation	IIT - Kanpur	43.20	2 years
2.	Wide - Area Damping Controller Design for Power Systems	National Institute of Technology, Rourkela	29.83	2 years

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
3.	Hydrogen Fuel Generation by Splitting of Water using Nano-sized Metal Doped Layered Titanates for Fuel Cell Applications	Anna University and University of Madras, Chennai	30.31	2 years
4.	Development of High temperature Low Sag Nano composite Core	SIT, Tumkur	28.00	2 years
5.	Development and AC Characterization of 2nd Generation High Temperature Superconductor (HTS) based Modular SFCL System	Inter-University Accelerator Centre, New Delhi-110 067	49.60	2 years
6.	Hybrid HVDC Systems for Multi Infeed Applications	M.S. Ramaiah Institute of Technology, Bangalore	17.00	2 years
7.	Inferring the dielectric and partial discharge characteristics of nano fluids for power transformer applications	Sona College of Technology, Salem – 636 005, Tamil Nadu	17.00	2 years
8.	Dielectric Diagnosis of EHV Bushings using Frequency Domain Spectroscopy (FDS) including cause Identification for Abnormal Conditions of the Bushing	Tamil Nadu Generation & Distribution Corporation Ltd., (TANGEDCO), Chennai, Tamil Nadu	40.00	2 years
9.	Development of Control Strategies for Grid Connected PV System utilizing the MPPT and Reactive Power Capability	Indian Institute of Technology , Kanpur	31.25	2 years
10.	Investigation on the operation and control of multiple distributed generation sources in micro grid (Phase-II)	National Institute of Technology Karnataka (NITK), Surathkal	25.00	2 years
11.	Development of intelligent relaying scheme for microgrids with DG penetration	Indian Institute of Technology, Bhubaneswar	28.00	2 years

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
12.	Day Ahead Solar Power Forecasting for Indian Climatic Zone	Central Power Research Institute, Bangalore	50.00	2 years
13.	Characterization of Electric Double Layer Super Capacitor with CNT-conducting Polymers / Metal Oxide Composites and Nano Dielectrics	R.V. College of Engineering, Bangalore	16.00	2 years
14.	Design, development and deployment of grid interfaced power conversion unit for solar - wind power generation system	Arunai Engineering College, Tiruvannamalai	3.45	2 years
15.	Compilation of Data on Latest Technologies in Geological & Geotechnical Investigations and Problems Faced & Mitigation Measures adopted during Execution of Hydroelectric Projects	Central Board of Irrigation and Power, New Delhi	40.00	2 years
16.	Studies on Development of Guidelines for Best Practices in Water & Waste Usage in Coal Based Thermal Power Plants	Excellence Enhancement Centre for Indian Power Sector, New Delhi	42.00	2 years
17.	Reduction of Switching Transients in Doubly Fed Induction Machines Used in Large Pumped Storage Plant	Indian Institute of Technology, Roorkee	23.75	2 years
18.	Development of Smart Grid, Controllers for Hybrid Renewable Distributed Generator for a Stand - alone and Grid-connected Operation Addressing Reliability and Power Quality Issues	National Institute of Technology, Puducherry	35.15	2 years
19.	Development of solid state transformer as a wind power interfacing device	National Institute of Technology, Calicut	28.00	2 years
20.	Erosion-Corrosion Studies on Thermal Sprayed Conventional and Nanostructured Coatings	Indian Institute of Technology, Madras	68.00	2 years

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
21.	Characterization and development of silicone rubber-EPDM Nano composites as outdoor insulating material for EHV applications	Indian Institute of Technology, Madras	61.00	2 years
22.	Studies to improve the performance of fault location algorithm for multi-location shunt fault in transmission line-A case study of Chhattisgarh State	National Institute of Technology, Raipur	27.00	2 years
23.	Development of a dsPIC based efficient system for simultaneous active power sharing and reactive power compensation in a grid-connected photovoltaic system	Mizoram University	7.10	2 years
24.	Adaptive protection schemes for microgrids with grid - connected and islanded mode of operation	Indian Institute of Technology, Roorkee	30.00	2 years
25.	Performance improvement of steam generator through the penhanced hydrophobic surface	Indian Institute of Technology, Bhubaneswar	49.98	2 years
26.	High temperature erosion characteristics of boiler tube materials of sub-critical and supercritical thermal power plants and prediction of critical erosion regions through CFD modelling	CPRI, Bangalore	49.86	2 years
27.	Experimental and computational analysis of heat sink application for optimal performance by developing low cost natural filler reinforced composite material	NIT, Silchar	49.50	2 years
28.	Development of Blue Light Emitting Diode packages	M.S. University of Baroda, Vadodara	49.50	2 years

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
29.	High performance PFC based LED Drivers working under Stringent AC Supply	Engineering College, Bikaner	34.76	2 years
30.	Development of Electrolytic-capacitor free Power Electronics driver for LED lighting with power factor correction for effective performance under grid voltage variation	Sasgar Institute of Technology, Bhopal	18.15	2 years
31.	IEC 61850 Compliant SF6 Monitoring System for Gas Insulated Switchgear	VSSUT, Burla	48.00	2 years

Projects under R&D under National Perspective Plan (NPP)

The project proposals are invited from Academia, Power Utilities, Electrical Equipment manufacturing companies and Research Institutes. The proposals are recommended by Technical Committees (Transmission, Grid, Distribution & Energy Conservation, Hydro and Thermal Research) and approved by Standing Committee on R&D chaired by the Chairperson, CEA, New Delhi.

The Ministry of Power is also supporting the research projects under UAY and IMPRINT scheme/programme of MHRD. Since the research projects under both the scheme/programme are mainly collaborative in nature involving participation of industry and the IITs, these are being considered as R&D proposals/projects under National Perspective Plan (NPP) scheme.

For the year 2017-2018, the following is the summary of the ongoing NPP projects:

Projects Taken by CPRI

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
1	Integrated sustainable power generation from short rotation forestry enhanced biomass in rural and semi urban areas within clean development mechanism (CO2 mitigation) - R&D initiative for National biomass action plan	Aligarh Muslim University (AMU), Uttar Pradesh	65.70	2 years

Sl. No.	Project Title	Organisation	Outlay (Rs. in lakhs)	Duration
2	Development of Nano-structures – transformer oil Nano fluids for improvement of thermal and insulating properties.	Bengal Engineering & Science University, Shibpur	80.16	2 years
3	Investigations on New Nano – composite materials for Electrical Insulation	IIT, Ropar	65.00	2 years
4	Development of a Selection Methodology for Roadheader and Tunnel Boring Machine in Different Geological Conditions for Rapid Tunnelling	CSIR - Central Institute of Mining & Fuel Research & Indian Institute of Technology (Indian School of Mines), Dhanbad	289.20	2 years
5	Development of polymer nano-composites for EHVDC Lines and diagnostics adopting laser induced breakdown spectroscopy (LIBS)	IIT, Madras	268.41	2 years
6	Study of photo biological safety of LED lamps and luminaire	CPRI, Bangalore	400.00	2 years
7	Investigation on flow instabilities in draft tube at off-design operation of hydraulic turbines	IIT, Roorkee	175.00	2 years
8	Establishing Novel Erosive Wear Test Facility for Testing of Materials Used in Hydroturbine Components	IIT, Madras	125.00	2 years
9	Low cost silicon rubber insulator	Raychem RPG Pvt. Ltd., Gujarat	141.90	2 years
10	Power Conversion, Control and Protection Technologies for Micro-Grid	Indian Institute of Science, Bangalore	336.00	2 years
11	Development of intumescent fire retardant nano-composites for medium voltage cable sheathing applications	The Energy and Resources Institute (TERI), Bangalore	134.00	2 years

Projects under UAY

Sl. No.	Title of Project	Organisation	Total Sanctioned Cost (Rs. in lakhs)
1	Development of a high efficiency, high pressure ratio 'Micro Steam Power Pump Block' of 100 kW capacity	Indian Institute of Science, Bangalore	208.00
2	Large bed PV smart system for dust mitigation and reliability*	IISc, Bangalore	156.91

* The project was discontinued due to administrative reason

Projects under IMPRINT

Sl. No.	Title of Project	Organisation	Total Sanctioned Cost (Rs. in lakhs)
1	A Software Tool for the Planning and Design of Smart Micro Power Grids	Indian Institute of Technology, Guwahati	202.92
2	Low Cost Indoor Occupancy and Climate Monitoring System for Energy Conservation	Indian Institute of Technology, Kanpur	88.75
3	Cognition and Control for Demand Management: Sensors, Actuators and Web Services for Smart Consumers	Indian Institute of Technology, Bombay	140.04
4	Data-Driven modelling, analytics and optimization techniques to manage building thermal demand	Indian Institute of Technology, Bombay	202.00
5	Power Converter Design and Implementations for Energy Efficient Applications using Wide-Band-gap Power Devices	Indian Institute of Technology, Kanpur	184.38
6	Decentralized Power Generation using Micro Gas Turbines	Indian Institute of Technology, Kanpur	398.96
7	Design, Development and Control of High-Speed Switched Reluctance Generator for Direct-Coupled Operation with Thermal Turbo-Machinery	Indian Institute of Science, Bangalore	395.00

Sl. No.	Title of Project	Organisation	Total Sanctioned Cost (Rs. in lakhs)
8	Development and Application of Small Scale Bending Tests for Residual Property Assessment of High Temperature Materials in Turbines	Indian Institute of Science, Bangalore	221.52

Sponsored Projects by other Ministry / Department / Institutions / Organizations etc.

Dielectric Materials Division

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1	Conducting Polymer based electrode material for supercapacitor	DST-SERB (Department of Science & Technology-Science and Engineering Research board)	3 years 04-May-2017 to 04-May-2020	23.06

Electrical Appliances Technology Division

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1	Capacity Addition to Refrigerator test facility	Bureau of Energy Efficiency (BEE)	2 Years	72.635

Energy Efficiency & Renewable Energy Division

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1.	Establishment of LED luminary test facility across various locations of India.	Bureau of Energy Efficiency (BEE)	Jan. 2018 to Mar. 2019	1620.00

Earthquake Engineering & Vibration Research Centre

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1	Seismic Performance Evaluation of Corroded RCC Frames by Shake Table Tests	BARC	Dec.2015 to Mar.2019	36.00

Materials Technology Division

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1.	Design and Development of Drop Tube Reactor System for NTPC-NETRA	NTPC-NETRA, Greater Noida	May 2013 to October 2017	281.00 (Procurement + Consultancy Charges)
2	Development of Micro-Hydel Power Generation by Local Water Streams for Drying Cardamom, Ginger, Mushroom and other Herbs and Vegetables at Sikkim	Sikkim State Council of Science & Technology (SSCS&T), Gangtok, East Sikkim	2 years July 2016 to July 2018	20.20

Metering & Utility Automation Division

Sl.No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. in lakhs)
1.	Technical Assistance for CPRI Smart Grid Test Bed	USTDA	November 2016 to August 2017	US$ 692,000

Information on Patents

The following are the innovative patents filed by CPRI during the financial year 2017-18.

The patents details are listed below: -

Sl. No.	Patent Title	Patent Application No.	Date of Filing	Inventors Name
1.	Methodology for obtaining Load Flow Solution in Weakly Meshed Electric Power Distribution System	201741011818	28/03/2018	Dr. Amit Jain Mr. James Ranjith Kumar
2.	In-Situ Low Intrusive Material Scoop Device for Extraction from Metallic Minerals	Yet to allot	27/04/2017	Dr. M.Venkateswara Rao Mr. Kishore kumar Dr. M Shekar Kumar Mr. R. K. Swamy M/s. Veltech Engineers, Hyderabad

Sl. No.	Patent Title	Patent Application No.	Date of Filing	Inventors Name
3.	Simulation Silt Erosion System for Grading Hydro Power Plant Material and Coatings	201741042935	30/11/2017	Dr. R.K.Kumar Dr. V Saravanan Dr. M Shekar Kumar Mr. Pramode
4.	Development of Natural Easter Based Dielectric Fluids for Transformer Oil Applications	Yet to allot	01/05/2017	Mr. V. V. Pattana Shetty Mrs. Ann Pamla Cruze
5.	Solar Hybridization of the Existing Thermal Power Plants to reduce Coal Consumption	Yet to allot	16/10/2017	Mr. T. Mallikharjuna Rao
6.	Specially Designed Trishul Porcelain Disc Insulators for Highly Contaminated Environment	Yet to allot	15/02/2018	Dr. N. Vasudev Mr. S. Sudalai Shunmugam

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SECTION - 3

EVALUATION & CERTIFICATION

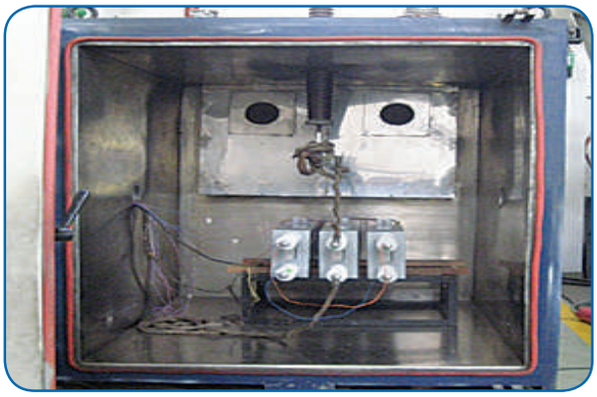
EVALUATION & CERTIFICATION

For the past more than five decades, the Institute has been serving the power sector in the field of evaluation and certification. CPRI laboratories are accredited by NABL, ISO 17025 & ISO 9001-2008, BIS, STL etc. During the year 2017-18, a total of 1,01,961 evaluations were conducted on 25987 samples for 5356 organizations which includes Central, State & Private Power Utilities and domestic and international electrical equipment manufacturers.

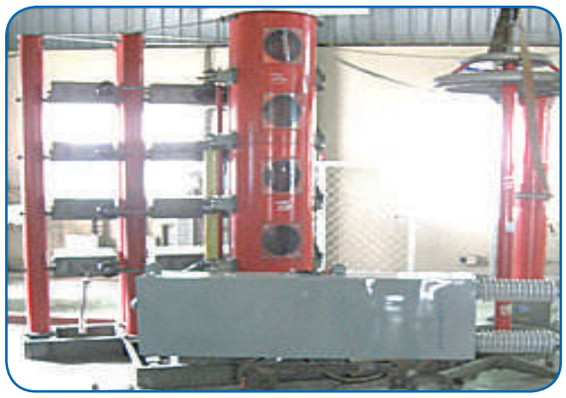
First – time Tests

Capacitors Division

Testing and evaluation of HT Shunt Capacitor of rating 1038.08 kvar, 18.667kV as per IEC 60871-1-2014 which was the highest rating of shunt capacitor manufactured in India and tested for the First time in CPRI.



Arrangement for Thermal Stability Test on 1038.08 kvar,18.667kV rated HT Shunt Capacitor



Test Arrangement for Lightning Impulse voltage test on 1038.08 kvar, 18.667kV rated HT Shunt Capacitor

Destruction test on Power Electronic capacitors

Destruction test of power electronic capacitors of rating 7500µF, 2.5 kV was conducted for the first time in the country at the Capacitors Lab., CPRI, Bangalore for a European customer as per IEC 61071 and customer's requirements. This test was carried out by using the available infrastructure without any investment.

Power electronic capacitor of rating 7.5 mF which underwent destruction test in the Capacitors Division for the first time

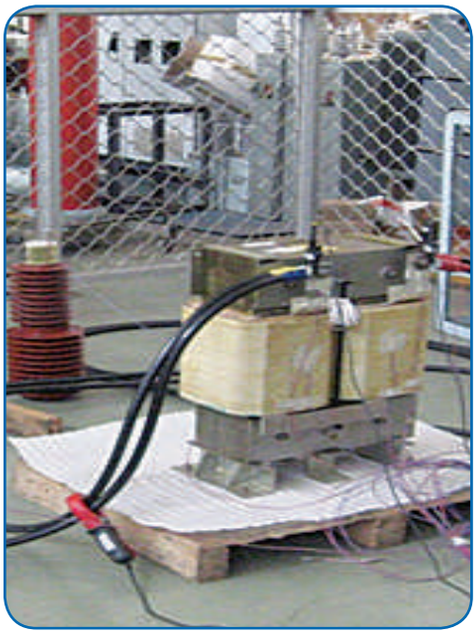
Thermal Stability test on Power Electronic capacitors

Thermal stability test on three numbers of power electronic capacitors of rating 9mF-2.8kV, 7.5mF-2.8kV and 7.5mF-2.8kV were tested simultaneously at 835Amperes for the first time in India at Capacitors Division of CPRI, Bangalore. This test was carried out for an European customer by using the available infrastructure without any investment.

A view of the test set up for conducting thermal stability test on 9000µF-2.8kV DC, 7500µF-2.8kV DC and 7500µF-2.8kV DC Power electronic capacitors simultaneously at 835 Amperes

Testing of Traction Inductor

Traction Inductor used on board in rolling stock was tested as per IEC 60310 using the available resources in CPRI, Bangalore. Two single phase iron core inductors and one three phase inductor were tested. This was the first time this test was taken up in CPRI. A view of one of the inductor undergoing test is as shown below:



1.5 mH, 1Φ, 650 A, Traction Inductor undergoing tests in the Capacitors Division

Environmental Test

Testing of 27kV, 630A, Load Break Switch for Low & High Temperature tests at -25ºC & +55ºC as per IEC 62271-103 Ed. 1.0- 2011-06 cl. 6.102.3. was carried out on customers request. As the system was powered by a continuously operating 24 V dc motor, it was not possible to use a breaker analyser for ascertaining the operating characteristics. Hence, a novel circuit was also devised to monitor the operating characteristics with the available resources in the capacitors lab. and the test was carried out successfully for an MNC. This was carried out for the first time in CPRI. All the above arrangements were made with internally sourced materials without any investment using the existing infrastructure. A view of the Load Break Switch tested is as shown below:

A view of the tested 3Φ, 27kV, 630A Load Break Switch in the Capacitors Division

Testing of Low Voltage Active Harmonic filter

For the first time in the country, a 3 phase, 4 wire, 415 V, 70 A, Active power harmonic filter was tested. Since there are no standards available, test circuits were designed and necessary alterations were made with the available resources in the capacitors Lab., CPRI, Bangalore. As no standard were available the Test methods were also devised in the division to cater to the requirements of the customer for verification of the effectiveness of the filter for compensating leading power factor loads, effectiveness of the filter for compensating lagging power factor loads, effectiveness of the filter for compensating current harmonics of various magnitudes as per the customer requirements, measurement of Losses of the Filter during harmonic compensation (ITHD) and Verification of effectiveness of the filter for correcting negative sequencing compensations with lagging power factor. A view of the tested filter is as shown below:

Active Harmonic Filter(AHF) undergoing tests in the Capacitors Division

Low Voltage APFC Panels

Tested 500 kvar, 440V APFC panels for type tests as per the latest Indian standard IS 16636:2017. It may be noted that apart from temperature rise test & Di-electric tests the latest Indian standard specified many new tests which are not there in IEC / IEEE standard. These include voltage withstand test between phases, Verification of effectiveness of automatic PF correction feature, measurement of transient over-currents due to capacitor switching. The above tests were carried out for the first time in India at Capacitor Division of CPRI, Bangalore. This is also the maximum capacity envisaged for testing under the BIS sponsored research project - Establishment of test facilities for LV APFC panels upto 500 kvar. A view of the tested panel is as shown below:

A view of the 3Φ, 500 kvar, 440 V, LV APFC panel undergoing tests in the Capacitors Division

Energy Efficiency & Renewable Energy Division

- Testing of Hybrid solar inverter of 20 kVA as per IEC 61683 & IEC 62116 for M/s. National Aerospace Laboratories, Bangalore.
- Testing of Grid connected solar Inverter of 1 kVA as per IEC 61683 for M/s. Voltech Engineers Pvt. Ltd.
- Testing of Solar PV Modules of various capacities as per IS 12762-1/ IEC 60904-1 for more than 10 customers.

High Voltage Division

- Performed HCSD test as per IEEE C62.11 on 6kV ELBOW arrester Section for the first time for M/s. Arrester works, USA
- Performed heat dissipation test on 208kV SH polymer surge arrester for the first time in India for M/s Oblum.
- Performed Lightning impulse withstand test on special power and signal communication cables for the first time for M/s FCI OEN.
- Performed test to verify repetitive charge transfer rating test on DM, SL, SM & SH classification surge arrester block samples for the first time as per IS 15086-4 2017 & IEC 60099-4

Insulation Division

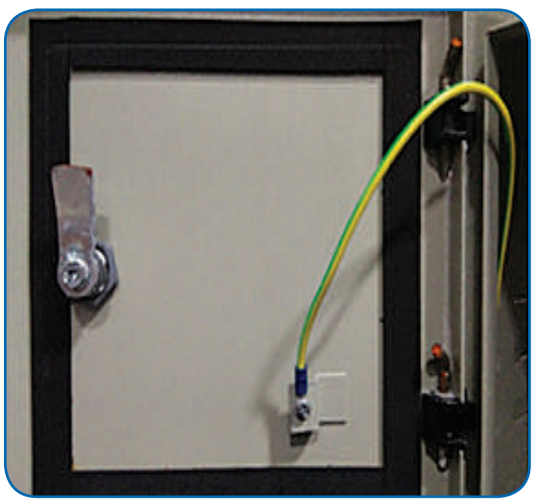
First time tests performed in the Division:

- Resistance to corrosion test both salt spray and sulphur dioxide gas, using Cyclic Corrosion Test chamber was performed for the first time by the Division. The samples tested during the year 2017-2018 included, representative samples of LT panels, earth rods, AB cable accessories of suspension clamp, dead end clamp, piercing connectors, straps and lightning

Cyclic corrosion test chamber at Insulation Division

Portion of earth rod post corrosion test in sulphurous atmosphere

arrestor assembly. More severe corrosion test using corrosive Sulphur dioxide gas was also performed for the first time by the Insulation Division. The chamber can cater to the following standards but not limited to, ASTM B117, NF C 33-003, IEC 61439-1, IEC 62561-1 and 2, BS EN 50483 Parts 2,3,4&6, DIN 50018, IEC 60068-2-11, IEC 60068-2-52, ASTM D1735, ASTM D2247, ASTM G85 Annex A4, EN ISO 3231, HD323.2.11, ISO9227, DIN EN ISO 6270-2 and VDA-test-621-415 (DIN 5002). Photograph given below depicts some of the samples after corrosion test.



Inside of the representative panel sample resistance to corrosion test showing the location of rust

Expanded photo of door knob with corrosion on a representative sample of a LT Panel post resistance to corrosion test

The Insulation Division also started commercial testing for the first time using UV florescent lamp weather o meter. The instrument is capable of simulating both UV A and UV B radiations at 340nm and 313 nm respectively, with varied temperature and humidity conditions. Samples tested includes cable outer sheaths, silicone rubber sheds and solar PV panels. Photographs below shows some of the samples post the UV radiation test.

Photograph of the UV test chamber using Fluorescent lamp

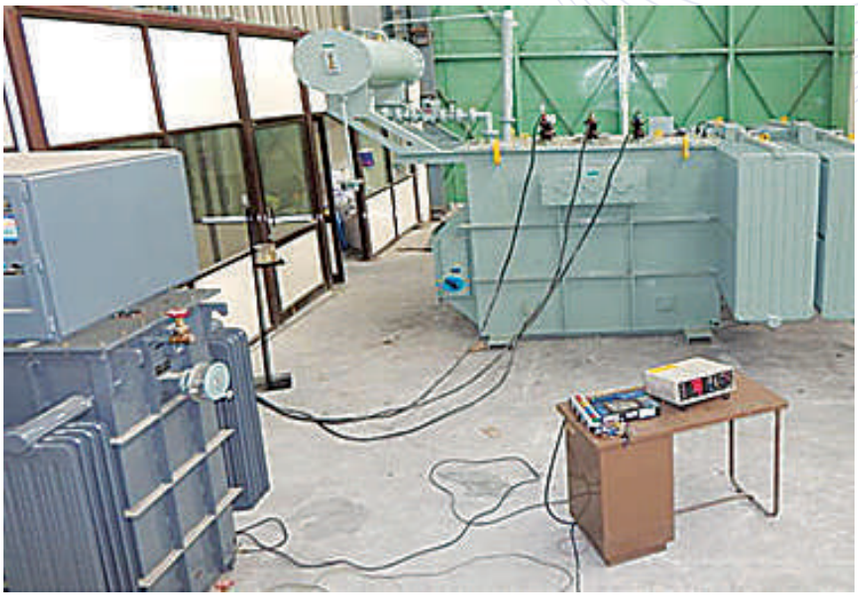
Change in color of cable outer sheath from before color of blue to after UV ageing color of black

Short Circuit Laboratory

- "Influence of Short time overcurrent test at 1.8kA for ½ cycle at 240V and Load Switching capability test (3000 operations at 60A, 240V UPF & 3000 operations at 10A, 240V 0.4 pf lagging) as per IS 16444 (Part 1): 2015 on Smart Meters, for the first time at Short Circuit Laboratory, CPRI, Bangalore.

"Influence of Short time overcurrent test on Smart Meters- First Time Test at Short Circuit Laboratory, CPRI, Bangalore"

- 2500 kVA 11kV/ 433 V Three phase Distribution Transformer of M/s. Kiran Power Rectification Services Pvt. Ltd. was subjected for Temperature-rise test for the first time at Short Circuit Laboratory and competed successfully with the association of Capacitors Division for arrangement of capacitor compensation.



Temperature rise test on Distribution Transformer for the first time at Short Circuit Laboratory, CPRI, Bangalore

New Test Facilities Created

Electrical Appliances Technology Division

Temperature Controller Water Bath for Endurance Test in Battery Lab., CPRI, Bangalore

Temperature controlled water baths (02 nos.) have been procured and commissioned to provide a temperature controlled medium for testing of batteries according to provisions of different National and International standards. Water temperature is controlled by sensor and digital controller to maintain 0° to 80°C. Water is continuously pumped around the temperature

sensor and batteries and heat is automatically added as required. The batteries can be lifted by automatic system attached with the bath. At a time 4 to 6 batteries can be tested which depends further on size of batteries.

Key features:

1. Made of Stainless steel with structural steel base with the water inlet and outlet connection
2. Water temperature is controlled by sensor and digital controller to maintain required temperature as per the standards/procedure
3. Size of tank (535mmx450mmx865mm)
4. Automatic arrangement has been made for the lifting of batteries
5. Water inlet and outlet connections have been provided

Earthquake Engineering & Vibration Research Centre

- Temperature and Humidity Chamber, Volume – 250 Liters, -70oC to +180oC, 25oC/minute, 10 to 98% RH .
- Temperature and Humidity Chamber, Volume – 800 Liters, -75oC to +180oC, 20oC/minute, 10 to 98% RH.

  Temperature and humidity chamber is used to determine the suitability of electrical equipment and components to withstand the rigors of its intended use environment, transportation and storage under high temperature, low temperature, rapid change in temperature, humidity and humidity combined with cyclic temperature changes.

  Temperature and humidity chamber is being used to test relays, energy meters, breakers, batteries, capacitors, electronics and communication equipment/components, automobile parts, equipment/components used in aerospace, equipment/components used in railways etc. as per National and International standards.

Temperature and Humidity Chamber, Volume – 250 Liters & 800 Liters

- **Vertical actuator added to servo hydraulic shaker system**

  Vertical actuator is added to existing servo hydraulic shaker system to operate shaker system in both vertical and horizontal direction without changing axis.

Vibration and shock are important in most engineering applications where the product is exposed to operating environment, transportation and to possible vibration and shock during service. Vibration testing is performed for a variety of reasons: to determine if a product can withstand the rigors of its intended use environment, to insure the final design will not fall apart during shipping, for environmental stress screening to weed out production defects, or even as a form of accelerated stress testing. Vibration tests are commonly used to improve the reliability of instruments, sub components and equipment or a system.

Vertical actuator

Using servo hydraulic shaker diverse range of vibration and shock qualification of electrical, electronics, telecommunication equipment / components are being carried out. Seismic qualification of Nuclear Power Plant equipment / components by single axis method is also being carried out using this facility.

Energy Efficiency & Renewable Energy Division

- Testing of Grid connected Solar PV inverter upto 500 kW capacity in Energy Efficiency & Renewable Division, CPRI, Bangalore started.
- Testing of Solar PV Module upto capacity of 500 W in Energy Efficiency & Renewable Division, CPRI, Bangalore is started
- Grid connected Solar Inverter test facility

Testing of inverters (both off-grid and on-grid) as per IEC 61683, IEC 62116 and IEC 60068-2(1, 2, 14, 30).

Testing of inverters

- Testing of solar photovoltaic modules as per IEC 60904-1 or IS 12762-1 standards. It is used to do performance measurement test as per standard test conditions of 1000 W/m2 and 25 degree Celsius.

Testing of solar photovoltaic modules

High Voltage Division

Vertical Thermo mechanical test chamber installed for carrying out bending test on ZnO Surge Arresters

Materials Technology Division

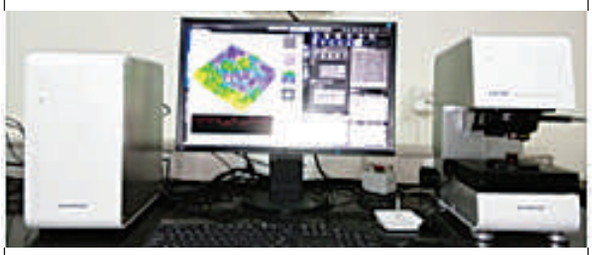
Indigenously Designed Development of Drop Tube Reactor System for NTPC-NETRA :

Materials Technology Division of CPRI, Bangalore indigenously designed and developed a high temperature Drop Tube Reactor (DTR) system, which can go up to1500°C for National Thermal Power Corporation -NETRA at the cost of Rs.281 lakhs.The DTR system was successfully installed & commissioned and demonstrated at NTPC-NETRA, Greater Noida. This was published in CPRI official twitter and face book with "Make in India" logo.

Conceptual DTR system

Automated DTR system installed at NTPC - NETRA, Greater Noida by CPRI

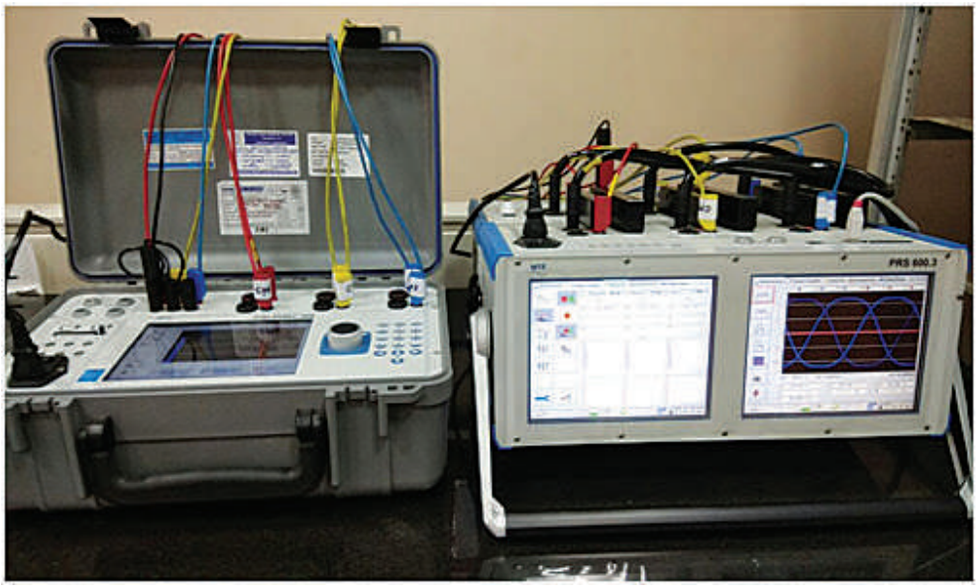
- Under the 12th Plan Capital project titled "Setting up of Advanced Research facilities like Centre of excellence for Non-Destructive Testing & Evaluation of Power plant components" , at an estimated cost of Rs. 8.00 Crores comprises of the following new test facilities :

Sl.No	New Test facility	Area of Application	Remarks
01	Electromagnetic Technique-NDT system	Thermal Power plant water wall Boiler tube Inspection	
02	Portable Ultrasonic system (EMAT based)	For boiler tube inspection for mapping of wall thinning of boiler tubes	
03	Laser Scanning confocal microscope for 3D surface profiling	To study the morphology/ surface damaged profiles of power plant components including coating integrity analysis	
04	Optical emission spectrometer for chemical analysis	Material elemental analysis of various power plants components such as Boiler tubes and turbine shaft	
05	X-Ray based residual stress measurement system for stress analysis	Measurement of surface Residual stress & its distribution and retained austenite in critical power plant components such as turbine shaft, gear system	

Sl.No	New Test facility	Area of Application	Remarks
06	Robotic system for boiler tube inspection	Automatic Inspection of thermal power plant boiler water wall tube without scaffolding arrangements by covering large volume of furnace wall inspection.	
07	3D Crack growth and fatigue life simulation System	Used for remaining life assessment of power plant component to determine the structural integrity of aged components	

Metering & Utility Automation Division

- Voltage & Current harmonic measurement in Calibration Laboratory of Metering & Utility Automation Division, CPRI, Bangalore started from the month of August 2017.



Three-Phase, fully automatic test system with class 0.02% reference standard and power quality analyser for calibrating three reference standard Energy Meters simultaneously

- Smart Meter testing facilities added in Energy Meter Testing Laboratory, Metering & Utility Automation Division, CPRI, Bangalore from the month of October 2017.

Photograph of 3 phase 4 Wire a.c. Static direct connected Watthour Smart Meter Class 1 is under metrological test

RTL-CPRI, Noida

- Energy Meter Test Laboratory is set up under 12'th plan Capital project. The laboratory provides services under developmental scheme and certification testing as per relevant National and International standards of Metering to the customers. The laboratory is NABL accredited for testing of static meters, prepaid meters and smart meters.

Energy Meter Test Laboratory at RTL-CPRI, Noida

Short Circuit Lab.

- Temperature rise test on Distribution Transformers has been upgraded up to 2.5 MVA 33 kV class at Short Circuit Lab. CPRI, Bengaluru with the addition of High Voltage source of 300 kVA, 2.5 kV – 1.25 kV, procured under 12th plan capital project.

- Short Circuit lab., CPRI, Bangalore has upgraded accuracy test facility on Potential transformer as per National and International Standards. Standard Potential Transformer of rating 66 kV with primary tap of 3.3 - 6.6 - 7.2 – 11 – 12 - 13.8 – 15 – 22 – 24 – 33 - 66 kV with secondary voltage of 190-110-110/√3-110/3 V has been added. Hence, The accuracy test on Potential Transformer including residual voltage transformer up to 66kV with any secondary voltage can be tested at Short Circuit Lab. CPRI, Bangalore.

33000 V/√3 / 110 V/√3 resin cast Potential Transformer during Accuracy test

UHVRL-CPRI, Hyderabad

- High pressure washing test facility for composite insulators was established at *UHVRL-CPRI,* Hyderabadand tests as per PGCIL specification were successfully conducted on insulators up to 765kV AC and 800kV DC rating.

High pressure washing test facility for composite insulators at UHVRL-CPRI, Hyderabad

Special Tests Conducted

- **Seismic qualification of substation equipment:**

a. 420 kV, Live tank current transformer with polymer insulator for M/s. GE T & D India Limited, Hosur

Seismic qualification test on Current Transformer

b. 145 kV three pole operated SF6 circuit breaker for M/s. Siemens Ltd., Aurangabad

Seismic qualification test on three pole operated Circuit Breaker

c. 245 kV SF6 circuit breaker for M/s. Siemens Ltd., Aurangabad

Seismic qualification test on Circuit Breaker

d. 245 kV Horizontal Double Break Disconnector for M/s. ABB India Limited, Vadodara

Seismic qualification test on Horizontal Double Break Disconnector

- **Vibration and shock testing of Railways applications - Rolling stock equipment:**

a. Relay Panel for M/s. Autometers Alliance Ltd., Noida

Vibration and shock testing of Relay Panel

b. High Reach Pantograph for M/s. Faiveley Transport Rail Technologies India Limited, Hosur

High Reach Pantograph

- Vibration, shock and seismic qualification of relays, circuit breakers, energy meters, communication equipment, control panel, relay panel, switchgears etc.

Vibration and shock testing of Smart Energy Meter

Capacitors Division

HV Capacitors

Testing and evaluation of HV Shunt capacitors of various ratings ranging from 100 kvar, 6.84 kV to 1038.08 kvar,18.667 kV from various organizations as per national and international standards and industry protocols in shortest possible time schedule.

Testing and evaluation of 1038.08 kvar,18.667 kV Fuseless HT Shunt capacitor was the highest voltage rating tested as per IEC 60871-1-2014, for the first time in capacitors laboratory.

Low Voltage Capacitor Testing

Due to the quality control from the GoI for testing of LV capacitors in a record two months all short duration tests of LV power capacitors were completed. Short duration tests as per the BIS orders on 27 varieties of rating from 25 kvar to 80 kvar of various voltage categories were carried out in the lab as per IS 13340-1:2012 / IEC 60831-1:2002 and IS13585-1 Amd 1:2012 : 2012 / IEC 60931-1:1996.

High Voltage Division

- Performed testing on Lightning Event Counter (LEC) for M/s. P T Zeus Prima Garda Lightning Protection Company, Indonesia.
- Determination of dynamic response of 500 kV steep front impulse divider for M/s. BHEL EPD, Bangalore by step response method as per IEC 60060-2 standard.
- Performed prefailure test on 144 V polymer surge arrester unit in order to conduct the short circuit test of 63 kA on complete arrester unit for M/s. Protektel, Poland

Mechanical Engineering Division

- Conducted mechanical tests on Bundle block sheave pulley for M/s. Slingco, UK and M/s. Multi-technologies, Bengaluru.
- Successfully conducted numerous and various tests (type tests, stress-strain test, ultimate tensile tests etc.) on various conductors of international customers such as for M/s. Ducab Cable Company, Dubai, M/s. FEC Cables Malayasia, M/s. BBS Cables, Bangaladesh, M/s. Giza Cables, Egypt, etc.
- Conducted the deflection under bending load of solid core post insulators for M/s. PPC Insulators, Austria.

UHVRL

- The UHVRL-CPRI, Hyderabad successfully carried out RIV and corona tests on 800 kV, HVDC conductor bundle and conductor accessories.

Third Party Inspections:

Conducted Joint Third Party Inspection with AP-Transco inspector for Inspection of 50 km ACSR Panther conductor of M/s. Arrow Cables Ltd. Hyderabad in Nov-2017.

Testing & Certification for Overseas Customers

Earthquake Engineering & Vibration Research Centre

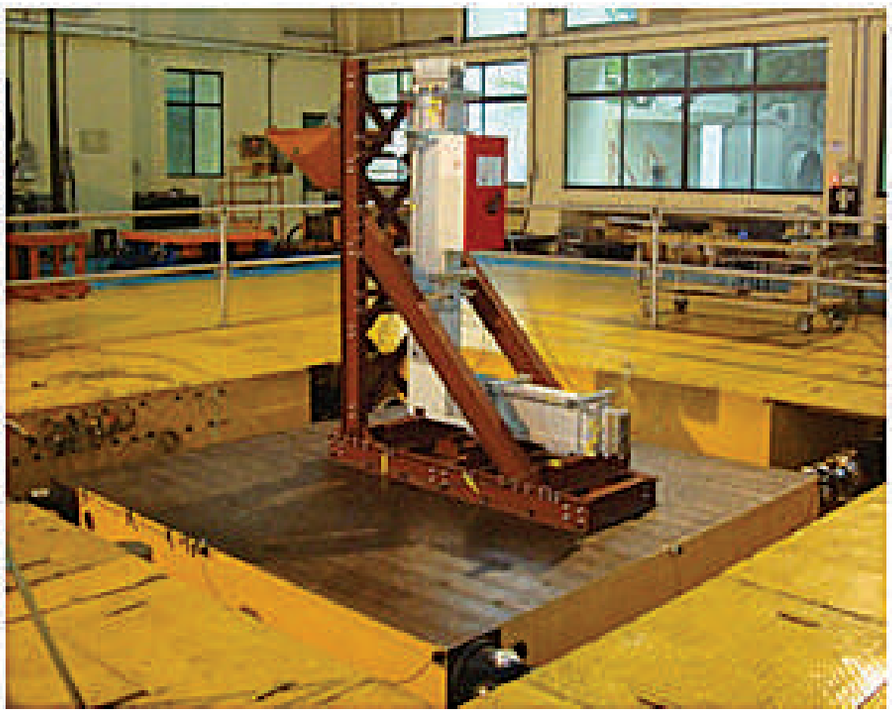
- Seismic qualification tests on 440 V Low voltage switchgear/Double front MCC for M/s. AL – AHLEIA Switchgear Co., Safat 13119, Kuwait

Seismic qualification tests on 440 V Low voltage switchgear

- Seismic qualification tests on Integrated Motor Control System Panel for M/s. AL – AHLEIA Switchgear Co. Safat 13119, Kuwait.

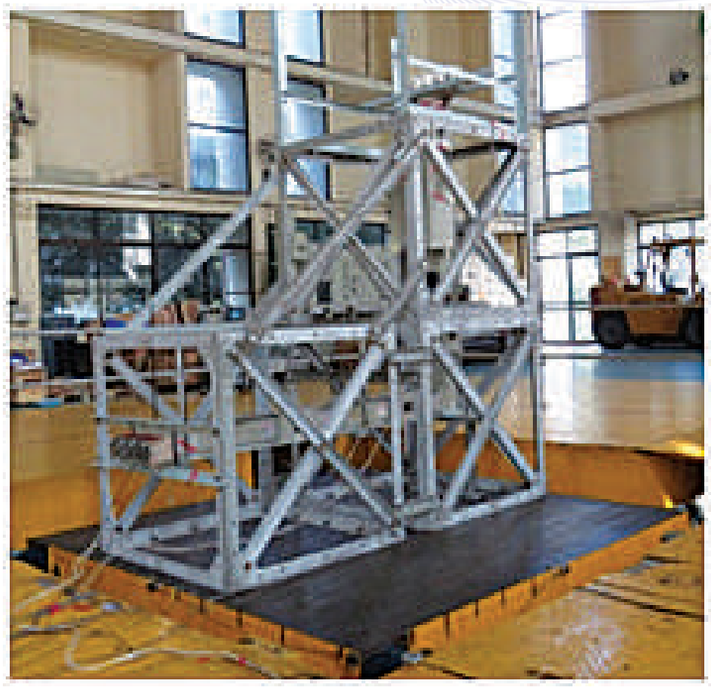
Seismic qualification tests on Integrated Motor Control System Panel

- Seismic qualification tests on 2500 A High power busbar with plugin box for M/s. National Electrical Products, Riyadh 11652, Saudi Arabia



Seismic qualification tests on 2500 A High power busbar

- Seismic qualification tests on 1600 A copper sandwich busbar trunking system with plug in box for M/s. Henikwon Corporation SDN BHD, Selangor Malaysia.



Seismic qualification tests on 1600 A copper sandwich busbar trunking system

High Power Laboratory

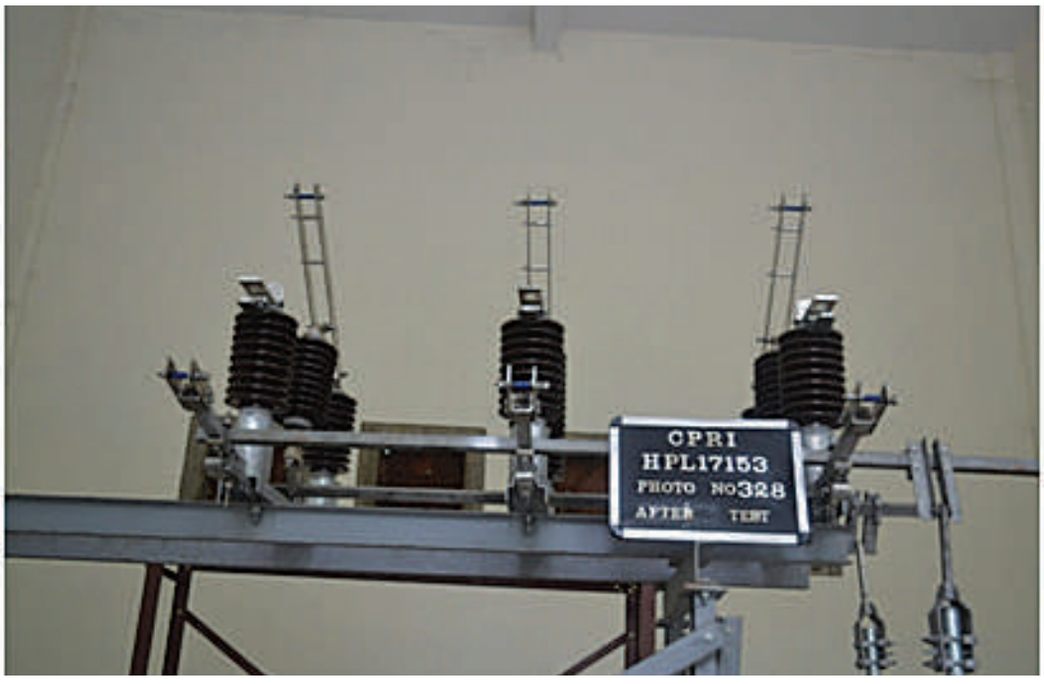
- 144 kV/60 kV Surge Arrester of M/s. PROTEKTEL, Poland was tested for Short-Circuit test on 6th April 2017

Short-Circuit test on Surge Arrester

- 1 MVA, 33/0.42 kV Three Phase Transformer of M/s. Pan Africa Transformers & Switchgears Ltd., Kenya was tested for Ability to withstand the dynamic effects of short circuit, on 22nd May 2017

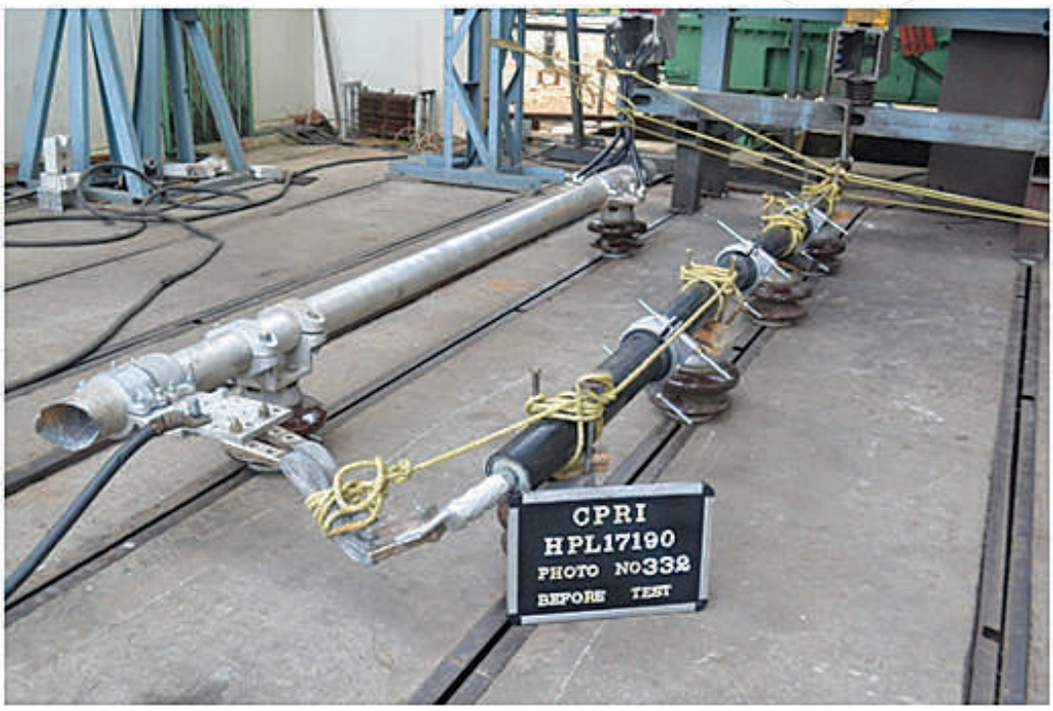
Ability to withstand the dynamic effects of short circuit test on Three Phase Transformer

- 36 kV, 1250 A, 31.5 kA Isolator of M/s. Energypac Engineering Ltd., Bangladesh was tested for Short time with stand current test and Peak with stand current test on 1st June 2017



Short time withstand current test and Peak withstand current test on Isolator

- 145 kV disconnector of M/s. Energypac Engineering Ltd., Bangladesh was tested for Short-Time Current Test, on 13th July 2017
- Internal arc test on cable link box of M/s. Al-Shahrani Factory, Riyadh, Saudi Arabia on 14th July 2017
- 230/380 kV Cable cleat of M/s. Al-Shahrani Factory, Riyadh, Saudi Arabia, was tested for Short time current test, on 6th July 2017



Short time current test on Cable Cleat

High Voltage Division

- Pre-failing test on Surge Arrester for M/s Protektel, Poland
- Dielectric test & Lightning impulse test on Dist. Transformer, Isolator, Current transformers, Dis-connectors switch & Power transformer for M/s. Energypac Engineering Ltd., Dhaka
- Lightning impulse test on Distribution Transformer for M/s. LTL Transformers Pvt Ltd., Sri Lanka.
- Artificial ageing test, Pre-failing test, L D Test, TOV test & Bending measurement test on Surge Arresters for M/s. Precise Electric Manufacturing Company Ltd., Thailand.
- Lightning impulse test on Distribution Transformer for M/s. Pan Africa Transformer and Switchgears Limited, Kenya.
- Lightning impulse test on Distribution Transformer for M/s. Automation Engineering Chittagong.
- Dielectric test on Link Box for M/s. Abdulla Al Shahrani GRP Contracting, Riyadh

- Lightning impulse test on Distribution Transformer for M/s. ACME Electronics Ltd., Dhakha, Bangladesh
- Dielectric tests on Composite station post insulators for M/s. Asasoft (Canada) INC, Canada
- Surge with stand test on Load break switch with control element for M/s. Schneider Electricss, Australia
- Seal leak test on Elbow arresters for M/s. Richords Manufacturing Co., New Jersey
- Impulse current test on Lightning counter for M/s. ZEUS, Prima Garda, Indonesia
- M/s. Nippon Steel and Sumitomo Metal Corporation, Japan, have utilized the Electrical Steel Test Facilities for evaluation of their samples, CRGO – Cold Rolled Grain Oriented for magnetic, electrical, and mechanical properties, at Materials Technology Division, CPRI, Bangalore.

TESTING & CERTIRICATION UNDER UL (Underwriters Laboratories):-

- Temperature rise test, short circuit test, IP test, Corrosion test on 250A DB & 400 ADB for M/s. Gama Engineering, Sharjah

Short Circuit Laboratory

- Few selected tests of Test Sequence I on 16A 415V DP MCB as per IEC 60947-2 for M/s. HPL Electric & Power Limited, Solan, H.P.
- Overload Performance test on 32A 415V DP MCB as per IEC 60947-2 for M/s. HPL Electric & Power Limited, Solan, H.P.
- Current measuring circuit test at 16 kA for 1 second duration on Energy meter with external CT as per IEC/UL/CSA 61010-02-030-12.
- Conditional short circuit test at 18 kA rms, 21.6 kA rms, 30 kA rms& 36 kA rms on 400 A 415 V 3 Pole & 250 A 415 V 3 Pole LV Switch Board as per IEC 61439-1 & 2 for M/s. Gama Engineering, Sharjah, UAE.

TESTING & CERTIFICATION UNDER INTERTEK-ASTA:

- Temperature rise test on 500 kVAr LV APFC Panel for L&T-India
- Seismic test on 1600 A Busduct for L&T Electrical & Automation, Malaysia
- Current Transformers for M/s. Precise Electricals
- 300 KV Double break disconnector for M/s. ABB , Vadodara, Gujarat

Membership of CPRI officers in International/ National Committees

The officers of CPRI are well represented in standardizing committees both at International and National level, viz., CIGRE Committee, IEEE, Academic Councils, Accreditation Panels, apart from being Empanelled Assessors for Laboratories, Research Committees, etc. CPRI contributes to evolve standards by participating in these committees. **The details of officers who were part of such committees during the year 2017-18 are provided in Appendix-9.**

CENTRAL POWER RESEARCH INSTITUTE

www.cpri.in

SECTION - 4

CONSULTANCY ACTIVITIES

CONSULTANCY ACTIVITIES

Distribution Systems Division, CPRI, Bangalore is working as Third Party Inspection & evaluation of 320 NJY feeders of Phase-1 & 2 works of CESC, Mysore

- Inspection of NJY feeders completed: 93
- Physical verification reports of NJY feeder submitted: 203
- Evaluation reports of NJY feeders submitted: 15

Distribution Systems Division, CPRI, Bangalore was working as a Project Management Agency for CESU area of OPTCL for DDUGJY and IPDS works

Distribution Systems Division, Bangalore was working as a Third Party Inspection Agency (TPIA) for Evaluation of HVDS schemes in Kanakapura & Tumkur Divisions for BESCOM.

Power Systems Division

1. Transient System Studies for additional thermal generation of 2x660 MW at Udupi Power Corporation Ltd. (UPCL), Mangalore

Power Systems Division, CPRI, Bangalore has carried out power evacuation studies (steady state and transient) for the upcoming 2x660 MW Udupi Thermal Power Project at Udupi, where 2x600 MW each are already in operation. The studies have been carried out for the 2019-20 scenario in the following three phases:

- **Phase I:** Existing 2x600MW and future case of (2x600 + 2x660MW) Udupi machines evacuating power with existing lines replaced with HTLS conductor for which the system was found to be unstable without 220 kV network.
- **Phase II:** Remedial measures like strengthening of 220 kV network with transformer and additional 220 kV lines, series compensation on 400 kV line from UPCL to Udupi switching station and strengthening of 400 kV network. Study results showed power oscillations under certain contingencies.
- **Phase III:** Additional evacuation lines were recommended as the system showed better transient and dynamic stability response.

As part of the studies, to maintain stability of the system, the number of generators to be tripped, lines to be tripped under various operating contingencies have been recommended.

2. Protection Audit DGEN MegaPower Plant

Third party protection audit has been carried out for the protection schemes of 400 kV substation of DGEN Mega Power Project -Torrent Power Ltd. Gujarat. The brief scope of work includes (a) Review of the implemented protection schemes/philosophy & setting in the 400 kV AIS (b) Review of availability/healthiness of communication links like PLCC, Optical fibers used for protection (c) Review and analysis of fault records (d) Checking healthiness of DC systems (e) Functionality of time synchronization unit, GPS, storage facilities and (f) Relay setting calculations and verification.

3. Bharat Electronics Ltd (BEL) Power systems Studies for BEL distribution systems

Power systems studies comprising of load flow, short circuit, review of existing protection and their coordination, lightning/switching over voltage and requirement of lightning arrestor has been carried out for BEL distribution system.

4. Protection Audit for M/s. SembCorp Gayatri Power Ltd, Nellore

Power Systems Division has completed the studies of Protection Audit of four units of M/s. SembCorp Gayathri Power, Nellore. The protection schemes for 660 MW ultra-thermal Power plant is reviewed in detail. This includes the unit and backup protection of generating units, generating transformer, unit transformer, station transformer, transmission lines and other 400 kV substation power equipment.

5. Estimation of losses from Generator Terminal to X bus of RBPH of SSHEP

Studies are being carried out to investigate the root cause for high power losses observed from generating terminal to substation power measuring point of the generators of M/s. Sardar Sarovar Hydro Project.

6. Protection Audit of Sarni Power generating plant:

Power Systems Division is executing the Protection Audit studies of two units of Sarni Power generating plants of M/s. Madhya Pradesh Power Generating Company. As part of the study the protection schemes for 250 MW Power generating units are being reviewed. This includes the unit and backup protection of generating units, generating transformer, unit transformer, station transformer, transmission lines and other 400 kV substation power equipment.

7. Grid Impact studies due to proposed online short circuit testing facility - 350 MVA at CPRI, Hyderabad

The Division has carried out the grid impact studies for the proposed 350 MVA short circuit facility at CPRI, Hyderabad and outcome of this study was successfully defended during meeting with CEA/POSOCO/TSTRANSCO. The finding of this study has helped in seeking the grid connectivity approval from CTU/POSOCO/CEA for commercial operation of laboratory.

8. Dynamic Testing of Protection Relays on Real Time Digital Simulator (RTDS)

The numerical Distance Protection Relay RED 670 from M/s. ABB has been tested for its dynamic performance as per the CIGRE document 'Evaluation of characteristics and performance of power system protection relays and protective systems' by Working Group-04 of Study Committee -34 (Protection) on Real Time Digital Simulator.

9. Capacitor Compensation Studies for the Southern Region, Southern Regional Power Committee, Bengaluru

In order to address the low voltage profile and shortfall in reactive power in Southern grid, Power Systems Division of CPRI, Bangalore has carried out the studies to assess the capacitor requirement for southern region of India and to recommend the required capacitor bank at 132 kV, 110 kV, 66 kV & 220 kV substations that improves the overall voltage profile of southern electric grid. The size and locations of the capacitors were recommended to improve the voltage profile.

10. Protection Audit of 220 kV Dahej Substation for Torrent Power Limited, Gujarat

The consultancy work carried out involved the third party protection audit for protection schemes of 220 kV Dahej substation of Torrent Power Limited (TPL), Gujarat. The brief scope of work includes (1) review of the implemented protection schemes/philosophy and settings in the 220 kV substation (2) review of availability/healthiness of communication links like PLCC, Optical fibers used for protection (3) checking healthiness of DC systems

(4) checking time synchronization unit, readiness and recording of DR and their storage facilities (5) relay setting calculations and verifications (6) steady state stability analysis of TPL substation system with interconnected clients and GETCO system (7) review the present switchyard system for possibility of using as double bus system (8) working out the co-ordinated protective relay settings for the incoming 220 kV feeders and outgoing feeders.

11. Protection Audit-Teesta Low Dam III, NHPC Ltd., Rambi

Third Party Protection Audit was carried out for the Electrical Protection System of 220 kV, 4x33 MW Teesta Low Dam III Power Station, NHPC Ltd., Rambi. The brief scope of work includes: (1) Checking the healthiness of the Primary & Backup protection scheme & settings for Generator, Generator Transformer, Busbar, Transmission Lines, UAT, SAT & LBB scheme etc. Recommend corrective action for any additional protection and disabling any unwanted setting/ protection (2) Checking healthiness/adequacy of 220/48V DC System available for protection/PLCC and suggest corrective measures in case of any problem (3) Review of availability/ healthiness of communication links like PLCC, optical fiber, recording instruments - Disturbance Recorder, Event Logger, Time synchronization unit (GPS) (4) To check adequacy of short circuit ratings of existing equipment/ switchgear as per existing short circuit levels.

Special Consultancy Activities

Capacitors Division

a) Details of special consultancy rendered

- On- line PD test by acoustic emission technique carried out on Generator Transformers-as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at THDC, TEHRI, Rishikesh, Uttarakhand.
- On- line PD test by acoustic emission technique was carried out on Generator Transformers-as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at THDC, Koteswar, Rishikesh, Uttarakhand.
- Condition monitoring of 400 kV class EHV circuit breakers at Koteshwar Power Station, THDC - Rishikesh, Uttarakhand as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment.
- The Capacitors Division is also associated with the consultancy project for preparation of DPR (electrical switchyard portion) for renovation, modernization, up-gradation and life extension studies of Khandong power station, of M/s. NEEPCO. The total project outlay is about Rs. 1.2 crore of which the division is involved in Rs. 14.0 lakhs work.
- On- line PD test by acoustic emission technique was carried out on Generator Transformers-6Nos. of rating 22 kV/(420/$\sqrt{3}$) kV, 270 MVA, 1φ, Generator Transformer as a part of consultancy work at site of M/s. Thermal Powertech Corporation India Limited, (A Sembcorp Gayatri Company), SPSR, Nellore - 524 344, Andhra Pradesh.
- Condition monitoring of 220 kV class EHV circuit breakers at Tanakpur Hydro Power Station, NHPC, Tanakpur, UTTARAKHAND as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment.

Cables & Diagnostics Division

- Condition Monitoring / Diagnostic testing on HV equipment of M/s. NHPC, NBPS, Alchi, Leh-Ladakh, J&K.

Condition Monitoring Test on 66 kV XLPE Cable, First Time by Diagnostic Testing Team of CPRI, Bangalore at an Altitude of 10000 feet.

- Condition Monitoring / Diagnostic tests on Electrical & Mechanical (EM) equipment of M/s. THDC India Ltd., Rishikesh, Uttarakhand at Tehri HPP & Koteshwar HEP.

Diagnostic Testing on Generator Transformer at THDC India Ltd., Tehri Hydro Power Project Site

- Condition Monitoring / Diagnostic tests on Generator Transformers of KPCL, Bangalore at Bhadra Generating Station, Saravathy Generating Station, Gerusoppa Generating Station, Ghataprabha Generating Station, Kadra Generating Station, Kodashalli Generating Station and Raichur Thermal Power Station.

Energy Efficiency & Renewable Energy Division

- 100% Net Zero Building Energy Audit (Renewable potential assessment)

The study concludes that the identified buildings at NHPC, Kalijhora and Regional Office, Siliguri areas are either with roofs of flat type or shed type and suitable for installation of Solar roof top power plants. A total of 522 kWp can be installed at the rooftop available on buildings at NHPC, TLDP-4 Kalijhora area and 436 kWp shall be installed at the rooftop available on buildings at NHPC Regional Office, Siliguri.

High Voltage Division

- Pollution mapping with reference to transmission system in Eastern region is under progress:
  - Pollution mapping of Southern region: Project completed, Financial report sent to Powergrid.
  - Pollution mapping of Eastern region : final Set of pollution measurement is under progress, chemical analysis and ESDD NSDD calculation is in progress.
- Carried out Earth Resistance Measurement for Earthcon + Terec + Earthing System for M/s. SGI Engineers, Bangalore during May 2017.
- Carried out Earth Resistance Measurement for Terec + Earthing System for M/s. SGI Engineers, Bangalore during May 2017.
- Carried out evaluation of Earthing System at RTPS, Raichur for M/s KPCL, Raichur.
- Carried out assessment of Earthing System at Shivasamudram Hydro Power House for M/s. KPCL during December 2017.
- Carried out Design of Ground mat for proposed Capacitor Bank Switchyard for M/s. ABB, Vadodara during December 2017 .
- Carried out Design of Ground mat for the proposed 110 kV substation at Savadathi wind form for M/s. C&G Associates, Bangalore.

Mechanical Engineering Division

- Design Checking of 132 kV S/C Tower for M/s. New Horizon Infra Consultants, Pune.
- Design checking of 132 kV D/C 'A, B, & C' type Monopoles for M/s. Salasar Techno Engg. Ltd., Uttar Pradesh.
- Design Checking of Pile foundation for 220 kV D/C Tower for M/s. S. J. Construction, West Bengal.
- Design checking of 220 kV D/C P2, P3A & P4A type Monopoles for M/s. Sharavathy Conductors, Bengaluru.
- Design Vetting of structural drawings, BOM of 220 kV D/C 'SB', 'SC' & 'SP' Type towers to M/s. Madhya Bharat Power Corporation Ltd., Gangtok.
- Design Vetting of 220 kV D/C 'PS+0m' & 'PS2+9m' Monopoles to M/s. Sharavathy Conductors Pvt. Ltd., Bengaluru.
- Design Vetting of 220 kV M/C type 'MCA', 'MCB' & 'MCD' type towers only with foundation & structural drawings, BOM for M/s. Chhattisgarh State Power Transmission Company Ltd., (CSPTCL), Raipur.
- Design Vetting of structural drawings, BOM of 220 kV D/C 'SP', 'SBR' & 'SCR' Type towers to M/s. Madhya Bharat Power Corporation Ltd., Gangtok.

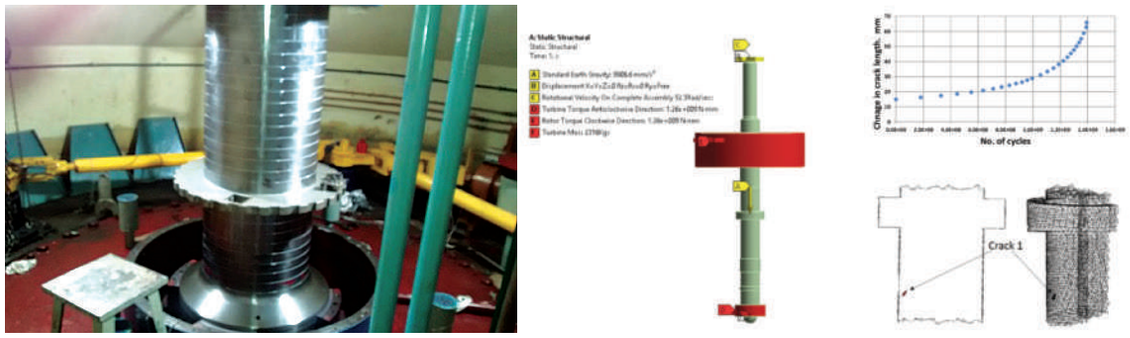
- Design Vetting of 220 kV D/C 'PS4+0/DE' & 'PS6+0/DE ' Monopoles to M/s. Sharavathy Conductors Pvt. Ltd., Bengaluru.
- Design Vetting of Foundation of 400 kV D/C type 'DA' tower for M/s. KSE International, Noida.
- Design Vetting of 220 kV D/C '220CT' Monopole to M/s. Valmont Structures Pvt. Ltd., Pune.
- Design Vetting of 220 kV D/C 'SM' Type Tower of M/s. Madhya Bharat Power, Gangtok.
- Design Vetting of 220 kV D/C '2D2', 220kV D/C '2D30' & 220kV D/C '2D60' Type Tower of M/s. PSTCL, Patiala
- Design Vetting of 132 kV D/C "PC+3" Type Mono Pole of M/s. Valmont Structures Pvt. Ltd., Pune
- Design Vetting of 220 kV D/C pile foundation for River crossing Tower of M/s. K. Ramachandra Rao, Hyderabad.
- Design Vetting of 132 kV D/C "PB", "PC1" & "PD" Type Mono Pole of M/s. Valmont Structures Pvt. Ltd., Pune
- Design Vetting of 132 kV D/C Type "MD-2" Tower for M/s. CSPTCL, Raipur

Materials Technology Division

- **RLA of Turbine and Generator shafts of KSEB, Sabarigiri Hydro Power plant**

  Materials Technology Division (MTD), CPRI, Bangalore has undertaken RLA of Turbine-Gen shafts in four units of 60/66 MW at Sabarigiri Hydro Power Plant, KSEB, installed during 1960s and undergone continued degradation owing to ageing conditions. KSEB has approached division to assess its remaining life of the shafts in the uprated loading conditions and recommend for fitness-for-further use of these critical shafts. MTD has formulated Life Assessment program of rotating shafts covering inspection using advanced Phased Array Ultrasonic technique for quantification of the defects/cracks, if any and estimation of Remaining Life through damage tolerance analysis. Finite element based fatigue and fracture analysis of the growth of existing cracks and estimation of crack growth rate was carried out using FRANC 3D software tools considering both the service loading conditions and laboratory evaluated mechanical properties of the shaft material. The results in terms of the re-inspection interval of these shaft or replacement were reported along with recommendations to the utility. The above program has immensely benefitted to the utility to take a decision on "fitness-for-further-use" of the existing turbine-generator shafts.

  The work program enhanced the capabilities of the division to formulate and standardize the methodologies for assessment of any hydro power plant shafts for their remaining life.

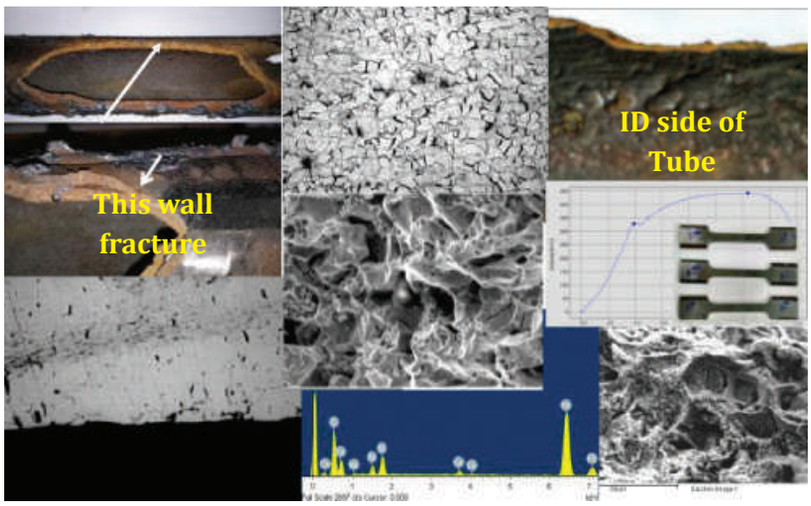


Life assessment of Turbine - Generator shafts of Sabarigiri HPP, KSEB

Based on the outcome of the results, KSEB has taken up the same work for three more units of Neriamangalam Hydro Plant during 2018-19.

- **Reduction of forced outages of water wall tubes through failure Analysis and in-situ corrosion mapping**

  M/s GMR Energy Ltd. has approached the MTD, CPRI, Bangalore for the root cause analysis for frequent failure of water wall tubes of 350 MW unit. Accordingly, the division has investigated two sets of failed tubes along with in-service good tubes extensively for their mechanical, metallurgical and fractography analysis. The root cause analysis revealed that the boiler water wall tubes are failed due to hydrogen attack in the tubes and recommendations were given to the utility for immediate inspection of the water- wall boiler tubes through CPRI established LFET technique. The continued inspection work at site resulted in the identification of seven tubes which were critically experienced corrosion damage and necessitate immediate replacement. The implementation of the CPRI findings immensely helped the utility in averting forced outages of the unit and to achieve improved reliability



Failure analysis of water wall tubes of 350 MW plant

Metering & Utility Automation Division

SCADA DMS consultants for the Puducherry Electricity Department, UT of Puducherry.

Smart Grid Project Management Consultants to TSSPDCL, Hyderabad for the Smart Grid Pilot Project being implemented at Jeedimetla, Hyderabad.

Consultancy for implementation of IMIS & SCADA to water supply scheme to Mysuru city under transition phase of JnNURM for Karnataka Urban Water Supply and Drainage Board, Jn-NURM Division, Mysuru

Ultra High Voltage Research Laboratory, Hyderabad

Measurement of Radio Interference Voltage (RIV) around 100 MVAR, STATCOM unit at 400/220 kV PGCIL substation, NP kunta, Ananthapur, AP was performed during 18th to 20th January 2018.

Measurement of Radio Interference Voltage (RIV) around 100 MVAR, STATCOM

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SECTION - 5

PROMOTIONAL ACTIVITIES

PROMOTIONAL ACTIVITIES

Important Conferences/Workshops Organised

- **"National Conference on Latest Trends in Switchgear and Controlgear – Smart Technologies"**

CPRI, Bhopal organized **"National Conference on Latest Trends in Switchgear and Controlgear – Smart Technologies"** on 23rd & 24th February 2018 at Hotel Noor Us Sabah Palace, Bhopal. The Chief Guest of the function was Shri I. C. P. Keshari, Principal Secretary, M. P., Energy Department and Guest of Honour was Shri V. Ramesh, Vice President, M/s. ABB, Nashik.

More than 100 delegates and dignitaries significantly younger people from Switchgear & Controlgear Manufacturers, Utilities, Academic institutions from all over the country participated in the Conference. 36 technical papers were presented by various organizations like L&T, BHEL, ABB, Siemens, GETCO, Schneider Electric etc. and STDS-Bhopal, High Power Laboratory, Short Circuit Lab., High Voltage Lab. of CPRI, Bangalore & UHVRL- CPRI, Hyderabad.

The discussions which took place during two days conference resulted in new directions in operating the smart electrical power grid with state-of-the-art switchgear equipment. The final conclusion emerged out of the Conference was "Failure Free Switchgear for Safe Electrical Network".

Inauguration of National Conference on "Latest Trends in Switchgear and Controlgear – Smart Technologies"

- **National Workshop on 'Synchrophasor for Real Time monitoring of smart power systems', 23rd & 24th November, 2017**

  A National Workshop on 'Synchrophasor for real time monitoring of smart power systems' was held at CPRI, Bengaluru on 23rd & 24th November, 2017 successfully and twenty three (23) delegates from different Utilities, Industries, Academia institutions and PMU manufacturers, have attended this Workshop.

Delegates of the National Workshop on "Synchrophasor for real time monitoring of smart power systems"

- **"ISGAN Knowledge Exchange programme on Distributed Generation, Microgrid and Smart Metering"**

  Metering & Utility Automation Division (MUAD), CPRI, Bangalore organized "ISGAN Knowledge Exchange programme on Distributed Generation, Microgrid and Smart Metering" jointly with NSGM, Ministry of Power, Government of India at CPRI, Bangalore, from 13th to 15th November 2017. 22 overseas delegates and over all more than 100 delegates participated in this Workshop. The Workshop was inaugurated by Joint Secretary (Distribution), Ministry of Power, Government of India. As a part of this 3 days Workshop interested delegates were taken to Smart Grid Pilot Project site at CESC, Mysore, on 13th November 2017.

Delegates of the "ISGAN Knowledge Exchange programme on Distributed Generation, Microgrid and Smart Metering"

- **Training Program on Awareness of Cyber Security for Power Utility Engineers, held at CPRI, Bangalore, on 4th August 2017**

  As per the instructions of Ministry of Power, Govt. of India, a Training Program on "Awareness of Cyber Security for Power Utility Engineers", was held at CPRI, Bangalore, on 4th August 2017. 39 delegates both from Southern Utility Companies and other organizations attended the Training Program. Prof. Govindarasu Manimaran from Iowa State University, USA delivered a guest lecture on "Cyber Physical System Security for Smart Grid". Other topics covered were "Cyber Security in Power Systems: Overview, Threats and Mitigation" and "Cyber Security Standards for Power Sector". The main objective of the Training Program was to give awareness about Cyber Security Norm and Best Practices, Do's and Don'ts to minimize Malware (Virus ,Trojan, infections and Worms etc.) while using Internet-connected or standalone Computers, Basic secure practices for E-mail usage and present cyber security standards.

Director General & Director-CPRI alongwith Delegates of the Training program on "Awareness of Cyber Security for Power Utility Engineers" held at CPRI, Bangalore, on 4th August 2017

- **Training Program on Awareness of Cyber Security for Power Utility Engineers, held at RTL-CPRI, Noida, on 13th February 2018**

  As per the instructions of Ministry of Power, Govt. of India, RTL-CPRI, Noida organized Training program on "Awareness of Cyber Security for power utility engineers", at RTL-CPRI, Noida, on 13th February 2018. Total number of participants were 29 from various utility companies in and around Northern Region like BBMP Chandigarh, UPPTCL Noida, PVVNL Merut, VVNL Mujaphar Nagar, BSES Rajandhani Power Delhi, BSES-BYPL Yamuna Power, NPCL Noida, TPDDL, PFC Delhi, DMRC Delhi and DTL Delhi and official staff of RTL-CPRI, Noida. Shri Sushil Kumar, Dy. Director General (IoT), TEC, DoT, Govt. of India delivered

lecture on Internet of Things Technology & Policies Overview. Smt. Shaileshwari M.U, Engg. Officer Gr. 3, CPRI, Bangalore delivered lecture on 'Cyber Security in Power Systems: Overview, Threats and Mitigation' and Shri Shivakumar V, Joint Director, CPRI, Bangalore on 'Cyber Security Standards for Power Sector'.

The main objectives of the training program was to give awareness about Cyber Security Norms and Best Practices, Do's and Don'ts to minimize Malware (Virus, Trojan and Worms etc.) infections while using Internet-connected or standalone Computers, Basic secure practices for Email usage and present cyber security standards.

Group Photo of Delegates of the Training program on "Awareness of Cyber Security for Power Utility Engineers", held at RTL-CPRI, Noida, on 13th February 2018

- **Training Program on Awareness of Cyber Security for Power Utility Engineers, at RTL-CPRI, Kolkata, on 27th February 2018**

As per the instructions of Ministry of Power, Govt. of India, RTL-CPRI, Kolkata organized Training program on "Awareness of Cyber Security for Power Utility Engineers", at RTL-CPRI, Kolkata, on 27th February 2018. Total number of participants were 22 from various utility companies in and around Eastern Region like WBSEDCL, WBSETCL, DVC, WBPDCL and official staff of RTL-CPRI, Kolkata. Shri Sujay Sarkar, Director (Human Resources), WBSEDCL delivered inaugural address. Smt. Shaileshwari M. U., Engg. Officer Gr.3, CPRI, Bangalore delivered lecture on ' Cyber Security in Power Systems: Overview, Threats and Mitigation' and Shri Shivakumar V, Joint Director, CPRI, Bangalore delivered lecture on 'Cyber Security Standards for Power Sector'.

The main objectives of the training program was to give awareness about Cyber Security Norms and Best Practices, Do's and Don'ts to minimize Malware (Virus, Trojan and Worms etc.) infections while using Internet-connected or standalone Computers, Basic secure practices for Email usage and present cyber security standards.

- **Training Program on Awareness of Cyber Security for Power Utility Engineers, held at STDS, CPRI, Bhopal, on 12th October 2017**

  As per the instructions of Ministry of Power, Govt. of India, a Workshop on "Awareness of Cyber Security for Power Utility Engineers" was conducted in STDS-CPRI, Bhopal, on 12th October 2017. 29 participants from M/s. MPMKVV Co. Ltd., Bhopal, Indore, Jabalpur, MPPTCL, Power grid, NHDC Bhopal, MP Power Management Co., Bhopal attended the Workshop. The introductory overview session was conducted by Smt. Shaileshwari, Engineering Officer Gr. 3, CPRI, Bangalore followed by an expert faculty lecture given by Dr. Deepak Tomar, Department of Computer Science, MANIT, Bhopal on "Cyber Security on Web based Systems" and concluding session was handled by Shri Shivakumar, Engineering Officer Gr. 4, CPRI, Bangalore on the topic of "Standards and cyber security for Smart Grid". He further explained on the vital role played by CPRI in this field.

Photograph on Workshop on "Awareness of Cyber Security for Power Utility Engineers" held at STDS, CPRI, Bhopal, on 12th October 2017

- **Training Programme on "Hands on Protection Relay School"**

  Two days Training Programme on "Hands on Protection Relay School"- Module 2: Transmission Line Protection, was held at CPRI, Bangalore, on 7th & 8th February 2018.

Delegates of the Training Programme on "Hands on Protection Relay School"- Module 2: Transmission Line Protection"

- **Training programme on "Third Party Protection Audit of NHPC Power House -Teesta Lower Dam III", Rambi, West Bengal, on 20th March, 2018**

  Power Systems Division, CPRI, Bangalore organized a day Training Programme on "Third Party Protection Audit of NHPC Power House -Teesta Lower Dam III", Rambi, West Bengal, on 20th March, 2018

Training Programme on "Third Party Protection Audit of NHPC Power House -Teesta Lower Dam III"

Awards & Accolades

Dielectric Materials Division

- Certificate of Excellence was awarded for Proficiency testing programme of IIS, Netherlands for testing of New & In-service transformer oil, furan analysis and PCB in transformer oil.
- Shri T. Mallikharjuna Rao, Joint Director, CPRI, Bangalore participated in 5th International Conference on "Coal Washing : A sustainable approach towards Green Environment" held at New Delhi, on 6th & 7th November, 2017 and won the "Coal Processing Innovation Award – 2016".

- On the occasion of Institute Day Celebration held on 16th January 2018, Mrs. K. P. Meena, Joint Director/HoD, Cables & Diagnostics Division, CPRI, Bangalore was awarded the **"Mylavarapu Subbalakshamma Award"** for the best lady Scientist of the year 2017. This award is constituted by Our former Director General Dr. M. Ramamurthy.

- Shri P. Chandra Shekhar, Joint Director, Electrical Appliances Technology Division, CPRI, Bangalore received Ph.D. Degree in Electrical Engineering, during Convocation held at JNT University, Anantapur (Andhra Pradesh), on 19th February 2018.

Power Systems Division

- Dr. Amit Jain, Joint Director, CPRI, Bangalore got second prize in the "Hindi Written Quiz" in Inter Office Hindi Competitions, which was organized among various organizations of Bengaluru, for the year – 2017. This competition was organized at ICAR – Indian Institute of Horticultural Research on 16th October 2017 under the auspices of Town Official Language Implementation Committee (Office-2), Bengaluru and he received the prize on 27th November, 2017 during the Joint Hindi Day Celebrations and Prize Distribution Function convened by the Office of Chief Postmaster General, Karnataka Circle, Bengaluru at General Post Office, Bengaluru.

Participation in Conferences/Exhibitions

1) Africa Utility Week (AUW) 2017 Exhibition:-

Central Power Research Institute (CPRI) participated in AUW 2017 exhibition, held at Capetown, South Africa, from 16th to 18th May, 2017. It was a great opportunity for networking and encompassed Conferences, Technical Meetings, Poster Sessions, Exhibition and Social Events. CPRI stamped its presence by putting up a Stall and promoted its services in the technical exhibition arena which lasted for 3 days. It opened up opportunity to make and maintain contacts with delegates from various countries like South Africa, Namibia, Ghana, Republic of Congo, Tunisia, Turkey, South Korea, UK, China, etc.

CPRI Officers namely Shri N R Mondal, Additional Director, RTL-CPRI, Noida and Shri R Shyam, Engineering Officer Gr.2, CPRI, Bangalore were deputed for manning the stall made special presentations to visitors. CPRI officers also participated in technical discussions with many manufacturers from various countries. Moreover since all the Indian exhibitors were present in a single pavilion titled "Indian Pavilion", it promoted brand India very well.

CPRI Officers with Mr. Rev. Ing William Hutton Mensah, Director (Distribution), Ministry of Power, Ghana

2) Energy Expo 2017, Surat, Gujarat:

CPRI participated in Energy Expo 2017 held at Surat International Exhibition Center, Surat from 8th to 10th September 2017. CPRI stamped its presence by setting up a Stall and showcased CPRI services at the exhibition. Footfalls to CPRI stall were more than 200 visitors including Manufacturers, Students, Customers, VIPs etc. Shri Ramadas, Engineering Officer, Information & Publicity Division and Shri Anand. S, Engineering Officer, Planning & Co-ordination Division, CPRI, Bangalore were deputed to mann the CPRI stall.

3) INDEE, BANGLADESH:

INDEE, BANGLADESH 2017 was organized under the aegis of Indian Embassy in Bangladesh with active support from Federation of Bangladesh Chambers of Commerce & Industry, India-Bangladesh Chamber of Commerce and Industry, Bangladesh Engineering Industry Owners Association, and Bangladesh Electrical Merchandise Manufactures Association. The exhibition was held at Dhaka, Bangladesh, from 2nd to 4th November 2017.

CPRI was allotted a one side open shell type stall, No. 2E8 in Hall No. 2. Dr. K. T. Varughese, Additional Director, Information & Publicity Division and Mr. Maheshwara Rao, Engg. Officer Gr..3, Short Circuit Lab., CPRI, Bangalore were deputed from CPRI for manning the stall and interacting with customers. CPRI presented its state-of-the-art test Facilities in the stall.

CPRI exhibition stall was visited by about 250 visitors and meetings were held with visitors from Bangladesh Electrical Utilities like Bangladesh Power Development Board and Rural Electrification Board. Some of the manufacturers, after their first interaction expressed their interest to send electrical products to CPRI for testing.

Mr. Mohammad Bazkur Rahman, Electrical Advisor & Chief Electric Inspector from Bangladesh Power Development Board visited on 4th November 2017 and appreciated CPRI services to Bangladesh manufacturers.

CPRI officers with Mr. Mohammad BazkurRahman, Electric Advisor & Chief Electric Inspector, Bangladesh Power Development Board

4) ELECRAMA 2018:-

CPRI participated in ELECRAMA 2018 organized by IEEMA, held at Knowledge Park-II, Greater NOIDA, from 10th to 14th March, 2018. Honorable Vice President of India Sri Venkaiah Naidu inaugurated ELECRAMA -2018 and Sri Suresh Prabhu, Union Minister of Commerce and Industry, GoI addressed the Inaugural gathering.

CPRI stamped its presence by setting up a fabricated Stall and showcased CPRI services at the exhibition. Footfalls to CPRI stall were more than 400 visitors including Manufacturers, Students, Customers etc. Many delegates visited CPRI Stall from various countries like China, Thailand, Israel, Kuwait, Africa, Dubai, Laos, Sri Lanka, Italy and Germany etc., and discussed about the test facility in CPRI.

Shri G. R. Vishwanath, Joint Director, Smt. Neha Adhikari, Engineering Officer, from RTL-CPRI, Noida and Shri Ramadas, Engineering Officer, Information & Publicity Division, CPRI, Bangalore were deputed to mann the CPRI stall.

CPRI Officers with overseas delegates from Laos at Elecrama stall

5) India Sourcing Fair, Russia:-

The Power Pavilion, Ministry of Power, Government of India showcased India's Power Potential at the three day India Sourcing Fair -2018 held at St Petersburg, Russia, from 20th to 22nd March, 2018. NTPC as the nodal agency for the Power Pavilion highlighted its potential as an International Player for New Power Projects in Developer Mode, taking over of old power projects and Renovation and Modernization. NTPC has been a pioneer in capacity building onshore, offshore and Training. Power Grid, CPRI, EESL and NHPC also participated in the Fair.

This event showcased products like Machine industry, Machine Building, Machine tool building, Metalworking, Metallurgical Engineering, Laser equipment and technologies, Robotics. Automation, Food processing machines, Pharmaceuticals/Chemicals & equipment, Scientific/Lab & Medical Equipment, Radio Electronics, Engineering and Hi-tech, Power Generation, Energy Saving Technologies, Tools, Electronics and instrument making etc. in the Industrial Products industry.

The Power Pavilion was inaugurated by **Shri Arun Kumar Panda,** Secretary, MSME, Govt. of India in the gracious presence of **Shri. Arun Kumar Sharma,** Consul General

of India, St. Petersburg, Russia. Senior Officers to Govt. of India which included **Ms. Renuka Kumar,** Director (Coordination), Policy and Planning, Ministry of Power and officials from Ministry of Steel and MSME were also present at the inaugural function.

Dr. K. T. Varughese, Additional Director, Information & Publicity Division, CPRI, Bangalore and Shri G. R. Vishwanath, Joint Director, Regional Testing Laboratory-CPRI, Noida participated in the India Sourcing Fair, a 3 day event held in St. Petersburg, Russia, from 20th to 22nd March, 2018.

CPRI Officers with MoP & MSME Officers at CPRI stall –India Sourcing Fair -2018

- Shri Abhay Kumar Khairwar, Joint Director, Shri Manoj Hirani, Engineering Officer Gr.2 and Shri T. Prabhakaran, Engineering Officer Gr. 3, STDS-CPRI, Bhopal participated in Vigyan Mela conducted by Madhya Pradesh Council of Science & Technology, Bhopal during 9th to 12th February, 2018. They put up a CPRI stall displaying details of testing and other services rendered by our Institute to the Power Sector of our country.

Visits of Important Persons / Foreign Delegations to CPRI

- US Dignitaries visited CPRI, Bangalore on 28th April 2017 led by Deputy Assistant Secretary Mrs. Elizabeth Urbanas, International Relations Specialist - Lauren Diekman, Political & Economic Officer-Mr. Joseph Bernath and Economic Specialist- Mr. George Mathew. Director General of CPRI, along with Officers welcomed the dignitaries and gave brief presentation about test facilities available in CPRI. Dignitaries from USA visited CPRI's Protocol & Metering Lab. and Energy Meter Testing Lab. Officers of CPRI explained the dignitaries about the functions, area of focus of the laboratory and equipment that can be tested in the laboratory.

D.G., CPRI welcoming the Dignitaries

- Mr. Gorab Dorji, General Manager, Rⅅ Mr. Pradeep Pradhan, Associate Director, Corporate Services and Ms. Tshering Zangmo, Senior Engineer, R&DD, CS from Bhutan Power Corporation (BPC), Bhutan visited CPRI, Bangalore on 18th July, 2017 for discussions regarding CPRI research in relevant fields / core areas in Transmission & Distribution and Innovative research being taken up. The visit was coordinated by Mr. Mallikharjuna Rao, Asst. Vice President, Local Sales & Marketing Manager, Power Grids Division – Nepal & Bhutan, M/s. ABB India Limited, Bangalore.

  The team had detailed discussions on Research activities of CPRI and have evinced interest in association with CPRI. They also visited laboratories for deliberations on the Research and testing facilities.

CPRI Officers interacting with Bhutanese Dignitaries during the meeting

- A team of Bangladesh dignitaries from Shakti Engineering Ltd, led by Mr. Nurul Anam, M.D Shakti Engineering Ltd., Progati Tower, Kha-214/E Progati Sarani Merul Badda, Dhaka-1212, Bangladesh visited CPRI Laboratories at Bangalore, on 12th July, 2017 to enquire about our test facilities at Bangalore and shown interest about CPRI's test facilities.

- UL Global Management team visited CPRI, Bangalore on 2nd August, 2017 to understand the testing facility and had discussions with Director General & Heads of Divisions of High Power Laboratory, Short Circuit Lab., Heat Run Test Lab. for testing collaboration between UL & CPRI. The delegates from UL were Mr. Jeffrey Smidt, VP & GM; Mr. Katz Gene, Director (BD); Mr. Wesley Kwok, Director (Engg); Mr. Sadasivam. V, Engg. Manager; Mr. Chander Kumar. S, Tech. Manager and Mr. Shashi Shekar, Business Manager. The visit was co-ordinated by UL India Pvt. Ltd., Bangalore.
- Two delegates namely Commander P. N. Shenoy and Commander Y. B. Goutham from Indian Navy visited CPRI, Bangalore on 5th September, 2017 to understand the testing facility and also visited Mechanical Engineering Division and Earthquake Engineering & Vibration Research Centre.
- Dr. Sudipta Banerjee and Mr. Sonal Mishra, Patent Attorneys of M/s. L. S. Davar & Co., Kolkata visited CPRI, Bangalore on 10th October, 2017 and had a detailed meeting on Patent filing, Patent First Examination Report (FER) etc.
- Shri. A. K. Das, Chief Vigilance Officer and Shri Gohar Reza, Manager/Vigilance from Dedicated Freight Corridor Corporation of India visited to CPRI, Bangalore on 12th & 13th October, 2017. Information & Publicity Division had arranged lab. visits to understand the testing facility available in CPRI, Bengaluru which included Mechanical Engineering Division, Vibration Lab., Materials Technology Division, High Voltage Division, Short Circuit Lab., Cables & Diagnostics Division, High Power Laboratory and Earthquake Engineering & Vibration Research Centre.

Electrical Appliances Technology Division

- Mr. Daniel Peter Montgomery from M/s. Thermal Hazard Technology, U.K. visited Electrical Appliances Technology Division, CPRI, Bangalore for Technical Discussion on battery safety testing facilities, on 13th December, 2017.

Visit of Mr. Daniel Peter Montgomery from M/s. Thermal Hazard Technology, U.K.

Energy Efficiency & Renewable Energy Division

- Mr. Jay Johnson, Sandia National Laboratories, USA, visited Energy Efficiency & Renewable Energy Division, CPRI, Bangalore, to provide validation platform software to check the proper functioning of inverter during testing, on 8th March 2018.

Earthquake Engineering & Vibration Research Centre

- Mr. Peter Douglas Frissell from M/s. Link Engineering Co., USA visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore to review technical details of Servo Hydraulic Shaker System & upgradation of the existing Servo Hydraulic Shaker System, on 27th & 28th April, 2017.
- Mr. Yahia Mutaz from UK visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore to witness Seismic test on M/s. L & T Bustrunking system, represented by M/s. Intertek India (P) Ltd., Bengaluru, on 17th & 18th July, 2017.
- Mr. Robert Lance from USA visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore to evaluate EVRC test facilities being used for their projects execution by local representative M/s. Base Research Pvt. Ltd., Bengaluru, on 06th July, 2017.
- Mr. Lee Kai Meng from Singapore visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore for witnessing of testing, executed by M/s. Delta Electronics India Pvt. Ltd., Bengaluru, on 21st July, 2017.
- Mr. Gadgaard Kristian from Denmark visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore for discussion regarding testing, represented by M/s. KK Wind Solutions India Pvt. Ltd., Bengaluru, on 13th December, 2017.
- Mr. Tigier Philippe Jalques from France visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore for witnessing the testing executed by M/s. Amco Saft India Ltd., Bengaluru, on 19th January, 2018.

Insulation Division

- Officials of M/s. Al-Hamad Industries International, Ajman, UAE visited Insulation Division, CPRI, Bangalore for witnessing temperature rise and resistance to corrosion test. Both the tests were successfully completed in due time.

Officials from M/s. AL Hamad Industries International, Ajman, UAE along with CPRI staff at Insulation Division

Metering & Utility Automation Division

- Mr. Heijker Niels Alexander, The Netherlands visited Metering & Utility Automation Division, CPRI, Bangalore for providing training to CPRI officers on IEC-Ed.2 61850 and UCAIUG aggradation at CPRI, Bangalore, from 20th to 22nd September, 2017.
- Mr. Amarnath Kannambadi Ramaswamy, EPRI, CA 94304, USA visited Metering & Utility Automation Division, CPRI, Bangalore for discussion on the smart grid project, on 1st December, 2017.
- Ms. Elizabeth Urbanas, Deputy Assistant Secretary, USTDA, USA, Mr. Lauren Diekman, International Relations Specialist, DoE, USA and Mr. Joseph Bernath, Political & Economic Officer, USA. visited Metering & Utility Automation Division, CPRI, Bangalore regarding review of USTDA Sponsored technical assistance for Smart Grid Test Bed and CPRI test facilities at CPRI, Bangalore, on 28th April, 2017.
- Construction Manager from M/s. Feka Construction company, Turkey along with Three officials from DABS, Afghanistan visited Metering & Utility Automation Division, CPRI, Bengaluru to witness testing of 1 Phase Static Meter, 3 Phase whole current meter & 3 Phase transformer connected meters on 19th & 20th February 2018.

Mechanical Engineering Division

- Mr. Tae Hyun Sun, Mr. Je YoulSeo & Mr. Shin Seung Bum from M/s. Korea Electric Power Corporation (KEPCO), Korea visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the testing on154 kV D/C Type "Ba2" 22M Steel Pole, for M/s. UBEC. Inc., Korea, on 25th May 2017.
- Mr. Dinka Biru & Mr. Negasi Teklay from M/s. Ethiopian Electric Power (EEP), Addis Ababa visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the 400 kV D/C Type "DS" (0-2 Deg. Dev.) Twin AAAC "ASTER-851" Tower with +12m Body & +3m Leg Extension, on 3rd & 5th July 2017.

Visit of Mr. Dinka Biru & Mr. Negasi Teklay from M/s. Ethiopian Electric Power (EEP), Addis Ababa

- Mr. Dinka Biru & Mr. Negasi Teklay from M/s. Ethiopian Electric Power (EEP), Addis Ababa visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the 400 kV D/C Type "DA" (0-30 Deg. Dev.) Twin AAAC "ASTER-851" Tower with +12m Body & +3m Leg Extension, on 15th July 2017.
- Engr. Haman Wamiju & Engr. Leonard Ogwufrom M/s. Transmission Company of Nigeria and Mr. Ngwoke Chidiebere, M/s. Power Projects Ltd./Dormanlong Engineering Ltd./GIT Genesis Engineering JV, Nigeria visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the testing of 132 KV D/C type 'DD60' basic tower and 132 KV D/C type 'DD90' basic tower, on 4th August 2017 and 9th & 10th August 2017.

Visit of Engr. Haman Wamiju & Engr. Leonard Ogwufrom M/s. Transmission Company of Nigeria and Mr. Ngwoke Chidiebere, M/s. Power Projects Ltd. / Dormanlong Engineering Ltd./GIT Genesis Engineering JV, Nigeria

- Mr. Carlos Alvarado from M/s. SAE Towers, Mexico visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the testing of 230 kV D/C Type 'PIE' Dead End Pole, on 15th & 16th November 2017.
- Mr. Suresh Jagadale, M/s. SCUBEC INTRA Solutions, Nasik & Mr. Abraham P Chacko, Sr. Project Manager from M/s. VencoImtiaz Construction Company, U.S., visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the 220 kV D/C Type 'AT' Suspension Tower with +6m Body & +0m Leg Extension, on 27th November 2017.
- Mr. Mukasa Frederick, Mr. Festus Kamya & Mr. Kahororo Job from Uganda Electricity Transmission Company Ltd. Mr. Erol Rahmanovic from INTEC-GOPA, Mr. Xing Wang from Changsu Fenfang Power Equipment Co. Ltd., China and Mr. Zhang Jianming & Mr. Guo Yonghua from Power China visited Mechanical Engineering Division, CPRI, Bangalore for witnessing the testing of 400 kV D/C Type 'DB/ST'(2-30 Deg.) Tower with +12m body & +4m leg extension, on 4th & 5th December 2017.

Visit of Mr. Mukasa Frederick, Mr. Festus Kamya & Mr. Kahororo Job from Uganda Electricity Transmission Company Ltd. Mr. Erol Rahmanovic from INTEC-GOPA, Mr. Xing Wang from Changsu Fenfang Power Equipment Co. Ltd., China and Mr. Zhang Jianming & Mr. Guo Yonghua from Power China

- Shri P Pradeep from M/s. Power Grid Corporation of India Ltd., Gurgaon visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing the Proto Type Testing (NOA No.7328) 320 kV HVDC (Bi-Pole) Type "A" (Narrow Based) Tower with +9m Body Extension, Wind Zone : 2 (39m/s), on turnkey project, on 22nd December 2017.

Short Circuit Laboratory

- Mr. Tanjil Islam, Senior Engineer from M/s. Energypac Engineering Ltd., Dhaka, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short-time withstand current and peak withstand current test at 31.5 kA rms for 3s with 78.75 kA peak carried out on 33 kV 1250 A Isolator with Earth Switch as per IEC 62271 – 102 for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, on 25th April, 2017.
- Mr. Milinda Gunawardhana, Senior Electrical Engineer & Mr. G. P. S Lakshman, Electrical Engineer from M/s. K. I. K Lanka (Pvt.) Ltd., Sri Lanka visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Conditional short-circuit test at 10 kA rms @415 V carried out on Incoming Circuit & Distribution Block of 415 V 63A Distribution Board as per IEC 61439-1 & IEC 61439-2, for M/s. K. I. K Lanka (Pvt.) Ltd., Sri Lanka, on 18th May, 2017.

Visit of Mr. Milinda Gunawardhana, Senior Electrical Engineer & Mr. G. P. S Lakshman, Electrical Engineer from M/s. K. I. K Lanka (Pvt.) Ltd., Sri Lanka

- Mr. Muralidharan from M/s. Pan Africa Transformers & Switchgears & Mr. Sivanandan from M/s. Emirates Transformer & Switchgear Limited, Dubai visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to Withstand the Dynamic Effects of Short circuit, Temperature-rise, Determination of Sound Level & other type tests carried out on 1000 kVA 11/0.433 kV & 315 kVA 11/0.433 kV Three Phase Oil Immersed Distribution Transformer, for M/s. Pan Africa Transformers & Switchgears, Nairobi, KENYA., during 16th to 24th May, 2017.
- Mr. T Selvanathan from M/s. Energypac Engineering Ltd., Dhaka, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short-time mechanical current rating test at 15 kA rms for 1 s with 40.5 kA peak carried out on 15 kV Outdoor Resin Cast Current Transformer as per IEEE C57.13 – 2008 for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, during 19th to 26th May, 2017.
- Mr. Rasika Chinthaka Welagedara, Electrical Engineer from M/s. LTL Transformers (Pvt.) Ltd., Sri Lanka and Mr. Lemma Bira Bushu, Electrical Engineer & Mr. Hagos Teklu Gebreslassie,

Internal Audit Manager from M/s. Ethiopian Electric Power Corporation, Ethiopia visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Temperature rise test carried out on 50 kVA 15 kV / 400 V, 100 kVA 15 kV / 400 V, 200 kVA 15 kV/400 V, 200 kVA 33 kV / 400 V, 315kVA 15 kV / 400 V & 315 kVA 33 kV/400 V Distribution transformers of M/s. LTL Transformers (Pvt.) Ltd., Sri Lanka, from 23rd to 30th May 2017.

Visit of Mr. Rasika Chinthaka Welagedara, Electrical Engineer from M/s. LTL Transformers (Pvt.) Ltd., Sri Lanka and Mr. Lemma Bira Bushu, Electrical Engineer & Mr. Hagos Teklu Gebreslassie, Internal Audit Manager from M/s. Ethiopian Electric Power Corporation, Ethiopia

- Mr. Md. Shahadat Hasan & Mr. Md. Atiqur Rahman from M/s. Sylvan Technologies Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit & Temperature-rise tests carried out on 50 kVA 11/0.415 kV, 100 kVA 11/0.415 kV, 200 kVA 11/0.415 kV & 250 kVA 11/0.415 kV Three Phase Distribution Transformers, for M/s. Sylvan Technologies Limited, Dhaka, Bangladesh, during 19th to 30th May, 2017.
- Mr. Rajat Majumder from M/s. Protec Electronics Ltd., Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 200 kVA 11/0.415 kV Three Phase Distribution Transformer for M/s. Protec Electronics Ltd., Dhaka, Bangladesh, from 1st to 4th May, 2017.
- Mr. Chandan Ghosh from M/s. Electropac Engineering Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 250 kVA 11/0.415 kV Three Phase Distribution Transformer, for M/s. Electropac Engineering Limited, Dhaka, Bangladesh, on 23rd June, 2017.
- Mr. Rajeev K V, Project Manager from M/s. AL Hamad Industries International, UAE, visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Verification of short-circuit withstand strength at 40 kA for 1 second and other verification tests carried out on 500 V 1600A 8 way LV Mini Distribution Pillar as per IEC 61439-1 & IEC 61439-2 for M/s. AL HAMAD INDUSTRIES INTERNATIONAL, UAE, from 16th to 21st August, 2017.

Visit of Mr. Rajeev K V, Project Manager from M/s. AL Hamad Industries International, UAE

- Mr. Md. Atiqul Islam Khan & Mr. Md. Jahangir Alam from M/s. Acme Electronics Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 200 kVA 11/0.415 kV Three Phase Distribution Transformer, for M/s. Acme Electronics Limited, Mirpur, Dhaka, Bangladesh, on 22nd August, 2017.
- Mr. Rajeev K V, from M/s. Al Hamad Industries International and Mr. NizarKilani & Mr. Mohammed Sadique from DEWA, Dubai visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Verification of short-circuit withstand strength at 40 kA for 1 second and other verification tests carried out on 500 V 1600 A 8 way LV Mini Distribution Pillar as per IEC 61439-1 & IEC 61439-2 for M/s. AL Hamad Industries International, UAE, from 15th to 21st September, 2017.
- Mr. M. Rafiqul Alam, Director and Mr. Faroque Ahmed from M/s. Prince Electricals Limited, Dhaka, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2010 & IEEE C57.12.00 : 2010 on Single Phase Overhead Distribution Transformers (15 kVA, 25kVA, 37.5kVA, 50kVA & 75 kVA), during 3rd to 16th October, 2017.
- Mr. Md. Iqbal Hossain, Project Head and Mr. M. A. Masud Khan from M/s. Sena Kalyan Electric Industries, Chittagong, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2010 & IEEE C57.12.00 : 2010 on Single Phase Overhead Distribution Transformers (5kVA, 37.5kVA & 75 kVA) and 200 kVA Three Phase Distribution Transformer, from 26th to 31st October, 2017.
- Mr. Md. Ashraful Islam & Mr. G H Kabir from M/s. General Electric Manufacturing Company Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 200 kVA 11/0.415 kV. Three Phase Distribution Transformer for M/s. General Electric Manufacturing Company Limited, Bangladesh, on 1st November, 2017.
- Representatives from M/s. Intertek India Pvt. Ltd., Bengaluru and M/s. Bureau Veritus India Pvt. Ltd., Bangalore visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short circuit test at 75A 3.8kV for 10 seconds carried out on 6.6kV Neutral Earthing Resistor for M/s. Tecton Engineering & Construction LLC, Abu Dhabi, UAE as per Customer's instructions, on 15th November, 2017.
- Mr. Anas Nasmanzil, Sales Manager from M/s. Manama Switchgear & Lighting W.L.L visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Verification of short-circuit withstand strength at 50 kA for 1 second and conditional short circuit tests at 30 kA carried out on 800 V 415A 3 way LV Distribution Panel as per IEC 61439-1 & IEC 61439-2 for M/s. Manama Switchgear & Lighting W.L.L, Kingdom of Bahrain, from 18th to 22nd December, 2017.
- Mr. Bimal Kumar Sarker, GM and Mr. R Alam Showkat, AGM from M/s. MANS Electrical Ltd., Dhaka, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2015 & IEEE C57.12.00 : 2015 on Single Phase Pole Mounted Distribution Transformers (5kVA, 10kVA, 15kVA, 25kVA, 37.5kVA & 50 kVA 6350/240V), from 5th to 12th January, 2018.

- Mr. Ashutosh Patil, Sr. Project Engineer from M/s. UL – Underwriters Laboratories, Middle East, Dubai, UAE visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Verification of short-circuit withstand strength at 36 kA for 1 second and conditional short circuit tests at 36 kA, 30 kA, 21.6 kA & 18 kA carried out on 415 V 400 A 8 way LV Switch Board & 415 V 250 A 8 way LV Switch Board as per IEC- 61439-1 & IEC- 61439-2 for M/s. Gama Engineering, Sharjah, UAE, from 9th to 12th January 2018.

Visit of Mr. Ashutosh Patil, Sr. Project Engineer from M/s. UL – Underwriters Laboratories, Middle East, Dubai, UAE

- Mr. Jefferin Roda, Application Engineer from M/s. 3M Malaysia SDN BHD, Malaysia visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Thermal Short circuit test through Screen at 25 kA rms for 3 seconds carried out on Cross bonding joint mounted on 1 x 630 sq.mm. Aluminium conductor XLPE insulated Copper wire screened 19/33 kV for M/s. 3M Malaysia SDN BHD, Malaysia, as per IEC- 60502-4:2010, on 11th January 2018.

Visit of Mr. Jefferin Roda, Application Engineer from M/s. 3M Malaysia SDN BHD, Malaysia

- Mr. Md. Hasan Ullah Sadi, Assistant Engineer from M/s. Energypac Engineering Ltd., Dhaka, Bangladesh and Mr. Selvanathan from M/s. Energypac Engineering Ltd., Kolkata visited Short

Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2015 & IEEE C57.12.00 : 2015 on 25kVA 6350/240V Single Phase Pole Mounted Distribution Transformers, from 20th to 25th January, 2018.

- Mr. Pappu Raj from M/s. Alwaye Load Selectors, Bengaluru and Mr. Takayuki Sano, QA Manager from M/s. Meidensha Corporation, Tokyo, Japan (the end user of the product) visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short-circuit current test at 4 kA for 5 seconds duration with 10kA peak carried out on 220 kV 800A 6 Positions Three Phase Off Circuit Tap Switch, as per IEC 60214-1:2014 for M/s. Alwaye Load Selectors, Bengaluru, on 13th March 2018.

Switchgear Testing and Development Station - Bhopal

- Mr. A.K.M. Mohibul Alam, Deputy General Manager visited Switchgear Testing & Development Station, CPRI, Bhopal for witnessing the Short circuit dynamic withstand test carried out on 10/14 MVA, 33/11.55 kV Transformer for M/s. T S Transformers Ltd, Dhaka, Bangladesh, on 7th July, 2017.
- Mr. A.K.M. Mohibul Alam, Deputy General Manager visited Switchgear Testing & Development Station, CPRI, Bhopal for witnessing the short circuit test on 5 kVA, 1 Ph, 6.35/0.24 kV Amorphous Distribution Transformer for M/s. T S Transformers Limited, Dhaka, Bangladesh, on 5th, 8th and 13th March, 2018.
- Mr. Md. Saiful Islam, Additional General Manager visited Switchgear Testing & Development Station, CPRI, Bhopal for witnessing the Short circuit test carried out on (a) 10kVA, 6.35/0.240 kV Single phase Transformer (b) 25 kVA, 6.35/0.240 kV Single phase Transformer (c) 50kVA, 6.35/0.240 kV Single phase Transformer (d) 37.5 kVA, 6.35/0.240 kV Single phase Transformer (e) 100 kVA, 6.35/0.240 kV Single phase Transformer for M/s. Confidence Electric Ltd., Dhaka, Bangladesh, on 7th, 8th and 23rd March, 2018.
- Mr. A.K.M. Mohibul Alam, DGM visited Switchgear Testing & Development Station, CPRI, Bhopal for witnessing the Temperature rise test, Lightning Impulse withstand tests carried out on 10/14 MVA, 33/11.55 kV Transformer for M/s TS Transformers Ltd, Dhaka, Bangladesh, on 13th July, 2017.
- Mr. Md. Saiful Islam, Additional General Manager visited Switchgear Testing & Development Station, CPRI, Bhopal for witnessing the Temperature rise test, Lightning Impulse withstand tests 25 kVA, 6.35/0.240 kV Single Phase Transformer for M/s. Confidence Electric Ltd., Dhaka, Bangladesh, on 14th and 23rd March, 2018.
- Mr. Govinthan, Mr. Suresh & Mr. Kashyap of M/s. AL Kiyumi Switchgear Manufacture, Sulatanate of Oman visited Station-2, STDS-CPRI, Bhopal for ASTA testing of 415 V, 1600 A and 3200 A Switchboards, from 26th October 2017 to 2nd November, 2017.

Ultra High Voltage Research Laboratory – Hyderabad

- Mr. Barekzai Mohammad Mujeeb & Mr. Ahmadi Naser, Engineers from Electrical Division, of M/s. Electric Supply Company, Afghanistan visited UHVRL-CPRI, Hyderabad for witnessing of RIV and corona tests on 500 kV, Triple ACSR, BISON conductor accessories for M/s. IAC Electricals Pvt. Ltd., Kolkata, on 14th August 2017.

Visit of Mr. Barekzai Mohammad Mujeeb & Mr. Ahmadi Naser, Engineers from Electrical Division of M/s. Electric Supply Company, Afghanistan

Important Events

Annual Customer Meet 2017:-

Annual Customer Meet of CPRI was organized at CPRI, Bangalore, on 2nd June 2017. Around 75 customers participated in the meet. CPRI has presented Action Taken Report on the feedback of previous Customer Meet and presented the New and Upgraded Test Facilities. CPRI welcomed the suggestions from customer. "Valued Customer Awards" were presented in five categories namely "Research and Development", Testing and Certification", "Consultancy/Field Testing", "Training" and "Vendor Analysis". The Programme ended with laboratory visits. There was a fruitful interaction with the customers.

DG, CPRI addressing the gathering at Annual Customer Meet- 2017

Director General with CPRI Officials and Customers during Annual Customer Meet 2017

State Level Painting Competition on Energy Conservation

Bureau of Energy Efficiency (BEE) under the Ministry of Power (MoP), Government of India (GoI) has initiated **"National Awareness Campaign on Energy Conservation- 2017"**, in which painting competition was organized for school children in all the States and Union Territories in the country. For the year 2017, Central Power Research Institute (CPRI) was identified as the Nodal Agency for implementation of the scheme in Karnataka State through Department of Public Instruction, Government of Karnataka. Training Division, CPRI, Bangalore was entrusted with this job of organizing the State Level Painting Competition. The State Level Painting Completion -2017 on Energy Conservation was held in the premises of Centre for Collaborative and Advanced Research (CCAR), CPRI, Bangalore, in the morning on 14th November 2017. The prize distribution function of the Painting Competition was held at CPRI Community Centre, CPRI Colony, New BEL Road, Bengaluru-12 in the evening. The competition was well attended by both Category - A and Category - B participants and we had a participation of 51 students in Category- A and 49 Students from Category -B. The event was recorded and telecasted by DD Chandana Channel.

CENTRAL POWER RESEARCH INSTITUTE

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SECTION - 6

TRAINING ACTIVITIES & PROGRAMMES

TRAINING ACTIVITIES & PROGRAMMES

Seminars/Conferences/Workshops/Training Programmes organised by CPRI during the year 2017-18

The phenomenal growth in the Indian Power Sector over past few years has magnified the need for absorption of latest technology in all the three spheres of Power Sector activity viz. Generation, Transmission, and Distribution. Coupled with this is the paucity of trained technical personnel and or skilled manpower.

Recognizing this need of the Indian Power Sector, CPRI has been in the forefront amongst many Training Institutes to disseminate the knowledge, assimilated by way of in-house research, through technical training programmes organized for:

- Upgrading the working skills of the Power Sector employees
- Training of personnel from Utilities/ Industries/ Clientele from Companies in the Power Sector in relevant skill for their day to day activities.

Constant efforts are being put up by CPRI for setting new standards in training and continuing education schemes, from basic theoretical knowledge to practical hands-on training in electrical systems. Training Programmes and Courses conducted by CPRI are well designed and have made substantial impact on the confidence level of the engineers actually working on the systems, by way of changing their thought process while working. The training modules are so designed to comprehensively address the specific need of the Power Sector Utilities and have benefitted large number of employees from Indian Electrical Equipment Manufacturers, Generation, Transmission and Distribution Companies for the past several years. The training courses help the technical workers/engineers by upgrading their occupational skills and improve their performance. This has led to the overall improvement in the efficiency in performance and competitiveness of the Indian Electrical Industry as a whole.

Workshops / Seminars / Conferences / Training Programmes Tutorials organized by CPRI during the year 2017-18:

Capacitors Division

1. On–site tutorial programme on "Diagnostic testing & Condition assessment of EHV Circuit breakers", held at Koteshwar Power Station, M/s THDC, Uttarakhand, on 21st November 2017.
2. Workshop on "Capacitors for reactive power compensation in LV & HV power systems", held at CPRI, Bangalore, on 22nd & 23rd February 2018.
3. On–site tutorial programme on "On-site Diagnosis & Condition assessment of HV Equipment-HV/EHV circuit breakers", held at Tanakpur power station, M/s. NHPC, Uttarakhand, on 28th March 2018.

Cables & Diagnostics Division

4. On-site Training Programme on "Diagnostic testing & Condition Assessment of HV Power plant equipment", held at NHPC, Leh-Ladakh, J&K, on 12th July 2017.

5. On-site awareness Programme for RLA, R&M and Uprating of Hydro Power Stations with a focus on Khandong Power House, held at Shillong, on 7th September, 2017.
6. One day Training Programme on "Diagnostic testing & Condition Assessment of HV Power plant equipment" for O&M engineers of Teesta- V, NHPC, held at Sikkim, on 4th January, 2018.
7. One day Training Programme on "Diagnostic testing & Condition Assessment of HV Power plant equipment" for O&M engineers of THDC, Tehri & Koteshwar, held at Uttarakhand, on 24th January, 2018.
8. Two days workshop on "Evaluation of Power Cables, Accessories and Fire Resistant Low Smoke Materials" , held at CPRI, Bangalore, on 27th & 28th February, 2018.

Dielectric Materials Division

9. Training Programme on "Condition assessment of mineral insulating oil in electrical equipment." for DGPC, Chukkha Project, Bhutan engineers, held at CPRI, Bangalore, from 29th May, 2017 to 2nd June, 2017.
10. Tutorial Programme on "Transformer Oil (In-service & New) and Diagnostic Tests (DGA, Furan Analysis & Degree of Polymerization)", Module I & Module II, held at CPRI, Bangalore, on 21st & 22nd August, 2017.
11. Training program on "Condition monitoring of transformer by oil analysis and safe handling of PCB contaminated transformer oil", held at RRVPNL, Jaipur, on 23rd February, 2018.
12. Training program on "Condition monitoring of transformer by oil analysis and safe handling of PCB contaminated transformer oil", held at RTL-CPRI, Kolkata, on 6th March, 2018.
13. Training program on "condition monitoring of transformer by oil analysis and safe handling of PCB contaminated transformer oil", held at TTIC Power Development Department, Jammu, Srinagar, on 8th & 10th March, 2018.
14. Two days Seminar on "Recent Trends in Insulating Fluids for electrical equipment", held at CPRI, Bangalore, on 1st & 2nd February, 2018.

Electrical Appliances Technology Division

15. Two days Workshop on "Opportunities and Challenges of Battery Based Energy Storage System", held at CPRI, Bangalore, on 4th & 5th September, 2017.
16. Workshop on "Ingress Protection testing", held at CPRI, Bangalore, on 8th December 2017.

Energy Efficiency & Renewable Energy Division

17. Training programme on "Thermal Power Plant Optimization", held at Hwange TPS, ZPC, Hwange, Zimbabwe, from 5th to 16th February, 2018.
18. Training programme on "Thermal Power Plant Optimization", held at Hwange TPS, ZPC, Hwange, Zimbabwe, from 19th February, 2018 to 2nd March, 2018.

Earthquake Engineering & Vibration Research Centre

19. Tutorial on "Vibration and Seismic Testing of Equipment", held at CPRI, Bengaluru, on 23rd February, 2018.

High Voltage Division

20. Workshop on "Testing of Surge Arresters as per latest standards: IEC 60099-4 and IS 15086-4", held at CPRI, Bangalore, on 19th January, 2018.

21. Two day Workshop on "Grounding practices", held at CPRI, Bangalore, on 22nd & 23rd February, 2018.

High Power Laboratory

22. Seminar on "Technology Trends in Design, Testing, Operation and Maintenance of Power & Distribution Transformers", held at CPRI, Bangalore, on 26th & 27th October, 2017.

Insulation Division

23. A six days exclusive residential training program on "Insulation Materials" for M/s. Raychem RPG Pvt. Ltd., Halol, Gujarat, held at CPRI, Bangalore, from 30th October, 2017 to 4th November, 2017.

Metering & Utility Automation Division

24. Training program on "Awareness of Cyber Security for Power Utility Engineers", held at CPRI, Bangalore, on 4th August, 2017.
25. Two day Workshop on "Smart Power Technologies", held at CPRI, Bangalore, on 14th &15th September, 2017.
26. Two days Workshop on "Smart Meter Testing Methodologies", held at CPRI, Bangalore, on 5th & 6th October, 2017.
27. Three days Workshop on "International Smart Grid Action Network (ISGAN) Knowledge Exchange programme on Distributed Generation, Microgrid and Smart Metering" organized jointly with NSGM, MoP, Government of India, held at CPRI, Bangalore, from 13th to 15th November, 2017.
28. National Workshop on "Emerging Trends in Energy Metering Technology", held at CPRI, Bangalore, on 22nd December, 2017.

Mechanical Engineering Division

29. Seminar on "Challenges and Probabilities in Design and Testing of Overhead Transmission Line Components and Accessories", held at CPRI, Bangalore, on 16th February, 2018

Materials Technology Division

30. Workshop on "Awareness Programme for RLA, R&M and Uprating of Khandong Hydro Power Stations", held at NEEPCO Shillong, on 7th & 8th September, 2017.
31. Two days training programme on "Coal Quality Assessment and its Impact on Power Plant Performance", held at CPRI, Bengaluru, on 8th & 9th March, 2018.
32. Seminar on "Remaining life Assessment of Hydro turbine generator shafts", held at KSEBL, Moolamattam, on 15th March, 2018.

Power Systems Division

33. Workshop on "Power System Stability and Control – with Integration of Bulk Renewables", held at CPRI, Bangalore, on 9th November, 2017.
34. National Workshop on "Synchrophasor for Real time monitoring of Smart Power Systems, held at CPRI, Bangalore, on 23rd & 24th November, 2017.
35. Workshop on '"Internet of Things for Renewable Energy", held at CPRI, Bangalore, on 27th November, 2017.
36. Workshop on "Emerging trends in Indian Electricity Market – Present & Future", held at CPRI, Bangalore, on 27th & 28th November, 2017.

37. Training program on "Protection System & Relay Coordination", held at CPRI, Bangalore, on 12th &13th February, 2018.
38. Workshop on "Hands on Protection Relay School: Distribution Protection", held at CPRI, Bangalore, on 9th February, 2018.
39. Two-days Training program on "Hands on Protection Relay School": Module 1 :Generator Protection & Module 2: Transmission Line Protection, held at CPRI, Bangalore, from 5th to 8th February, 2018.
40. Training programme on "Power System Protection", held at M/s Ultratech Cement Ltd., Adityanagar, Malkhed Road, Kalaburgi, on 12th & 13th February, 2018.

RTL-CPRI, Kolkata

41. Training program on "Awareness of Cyber Security for Power Utility Engineers", held at CPRI, Kolkata, on 27th February, 2018.
42. Training Program on "Condition Monitoring on Transformer by Oil Analysis and Safe Handling of PCB Contaminated Power Transformers", held at CPRI, Kolkata, on 6th March, 2018.

RTL-CPRI, Noida

43. Training Program on "Awareness of Cyber Security for Power Utility Engineers", held at CPRI, Noida, on 13th February, 2018.

Short Circuit Laboratory

44. One day Tutorial Program on "Assessments of Distribution Transformers through Testing & Analysis", held at CPRI, Bangalore, on 30th August, 2017.
45. Tutorial Programme on "Significance and Testing of Instrument Transformer in Power Sector", held at CPRI, Bangalore, on 20th February 2018.

STDS-CPRI, Bhopal

46. Workshop on "Awareness of Cyber Security for Power Utility Engineers", held at STDS, CPRI Bhopal, on 12th October, 2017.
47. National Conference on "Latest Trends in Switchgear & Controlgear - Smart Technologies", held at Hotel Noor-Us-Sabah Palace, Bhopal, on 23rd & 24th February, 2018.

TRC- CPRI, Koradi

48. National Workshop on "Engineering Trends for Health Assessment of Power Station and various Process Industries", held at CPRI, Koradi, on 10th November, 2017.

Training Division

49. Three Week "Residential Induction Training Programme" for Engineers of M/s. West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata (Batch-24), held at CPRI, Bangalore, from 3rd to 22nd April, 2017.
50. Three Week "Residential Induction Training Programme" for Engineers of M/s. West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata (Batch-25), held at CPRI, Bangalore, from 10th to 31st May, 2017.
51. Six days "Residential Exclusive Training Programme" for Engineers of M/s. RITES, Chennai , held at CPRI, Bangalore, from10th to 15th July, 2017.

52. Three Week "Residential Induction Training Programme" for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata (Batch-26), held at CPRI, Bangalore, from 21st August to 9th September, 2017.
53. Three Week "Residential Induction Training Programme" for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata (Batch-27) , held at CPRI, Bangalore, from 20th November to 9th December, 2017.
54. Three Week "Residential Induction Training Programme" for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata (Batch-28), held at CPRI, Bangalore, from 18th December 2017 to 6th January, 2018
55. Three Week "Residential Induction Training Programme" for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata (Batch-29), held at CPRI, Bangalore, from 29th January to 17th February, 2018.
56. Three Week "Residential Induction Training Programme" for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata (Batch-30), held at CPRI, Bangalore, from 5th to 24th March, 2018.

UHVRL, CPRI-Hyderabad

57. Tutorial Program on "High Voltage Testing & Measurement Techniques", held at UHVRL-CPRI, Hyderabad, on 18th August, 2017.
58. Two days Workshop on "Recent trends in AC/DC Transmission Systems", held at UHVRL-CPRI, Hyderabad, on 16th & 17th November, 2017.
59. One day Tutorial program on "Testing of Power and Instrument Transformers", held at UHVRL- CPRI, Hyderabad, on 5th January, 2018.

Photos of some of the important Conference/Workshop/Training Programmes organized

Director General & Director-CPRI alongwith Delegates of the National Workshop on "Emerging Trends in Energy Metering Technology", held at CPRI, Bangalore, on 22nd December, 2017

Group photograph taken on the Inauguration Day of Training Programme for M/s. RITES on 10th July 2017

Group photograph taken on the Inauguration Day of Training Programme for engineers of WBSEDCL of Batch No.26 on 21st August 2017

Group photograph of Inaugural Function of Training Programme for Engineers of M/s. Raychem RPG on 30th October 2017

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SECTION - 7

CAPITAL PROJECTS

CAPITAL PROJECTS

As the Power sector of the country is expanding, additional power capacity is being added and an addition of 78,000 MW Capacity was planned in the Twelfth Five-Year Plan. This demand for additional power calls for installation of additional equipment for generation, transmission and distribution of power. Additional equipment, in turn, bring in need for augmenting testing facilities. During the XI Five-Year Plan itself, the MoP, GoI approved several projects to enhance the research and testing facilities at CPRI. Some of the projects are spilled over to XII Plan.

XI Plan Project - "Participation of CPRI as an equity partner in the J.V. Company- National High Power Test Laboratory Pvt. Ltd. (NHPTL)"

Ministry of Power has sanctioned a project under XI Plan titled "Participation of CPRI as an equity partner in the J. V. Company - National High Power Test Laboratory Pvt. Ltd. (NHPTL)" with an outlay of Rs. 24.00 Crore towards payment of equity share of CPRI in J. V. Company-NHPTL, in which PGCIL, NTPC, NHPC, DVC and CPRI are J. V. Partners.

National High Power Test Laboratory Pvt. Ltd. (NHPTL), a Joint Venture Company of NTPC, NHPC, POWERGRID, DVC and CPRI has been incorporated at the cost Rs. 380 Crores (Approx.) for the establishment of state-of-the-art, professionally managed, international class, On-Line High Power Short Circuit Test Facility with an Equity Debt ratio of 40:60. The equity portion is held together by the Joint Venture holders in an equal proportion of 20% each and debt portion has been funded by Power Finance Corporation (PFC).

In establishing the NHPTL, M/s. CPRI has been engaged as a Review and Management Consultant and also CPRI has been engaged for the Management of Operation & Maintenance of the Laboratory for ten years with effect from the date of commercial testing.

National High Power Test Laboratory Pvt. Ltd. (NHPTL) has started its commercial testing for online short circuit testing of 765 kV class Transformers on 11th September 2017 which has now become the World's first laboratory for the same.

XII Plan Proposals

CPRI has been earmarked with Rs.1,368.90 Crores by MoP, Govt. of India as Govt. Budgetary Support during 12th Plan period (2012-2017).

A project titled "Augmentation & New Facilities Projects", at a total cost of Rs. 105.90 crore is approved and is under implementation from March 2014. This project is likely to be completed by March 2019.

Another Capital project with an outlay of Rs.996.10 Crores ("Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment-Outlay Rs. 640.00 Crores" and project titled "Establishment of New Test Facilities-Outlay Rs.356.10 Crores") under the 12th Five Year Plan, was approved as one project proposal by Finance Ministry & MoP vide order No.5/5/2014-T&R dated 5th January 2015 & is under implementation from April 2015.

"Research & Development Schemes of CPRI" under XII Plan at an estimated cost of Rs. 80.00 crore was approved on 11th June 2014, comprising of In-house Research Schemes of CPRI (Rs.15.00 crores), Research Scheme on Power (Rs.20.00 Crores) & R&D under National

Perspective Plan (Rs.45.00 Crores) are under implementation. Further, for continuation of the R&D Schemes of MoP being implemented through CPRI beyond 2016-17, the Ministry of Power has released an amount of Rs. 10.8284 Crore during Financial Year 2017-18.

The details of the XII plan projects/schemes are given in the table below:

Details of XII Plan Projects/Schemes:

Sl. No.	Title of the Proposal	Cost (in Crores)
I.	**'Augmentation and New Facilities Projects" of CPRI under XII Plan' at an estimated cost of Rs. 105.90 Crores, comprises of following project components:**	
	(i) Upgradation of High Voltage/Ultra High Voltage Test facilities	14.00
	(ii) Upgradation of Real Time Digital Simulator	8.35
	(iii) Augmentation of Energy Meter & Calibration laboratory	15.87
	(iv) Augmentation of Protocol and Meter Testing Laboratory	15.68
	(v) Establishment of test facility for (a) Solar PV based Grid tied Inverter systems (up to 500 kVA) and (b) Solar PV modules (up to 500 Wp)	28.00
	(vi) Augmentation, Modernization and Capacity Addition of Battery, Ingress Protection and Illumination test facilities	11.00
	(vii) Augmentation & Modernization of Diagnostics, Cables, Capacitors, Temperature Rise test, Environmental test facilities	13.00
II.	**"Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment" under XII Plan, at an estimated cost of Rs.640.00 Crores, comprises of following project components**:	
	I. Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators with associated equipment at High Power Laboratory, CPRI, Bangalore.	509.00
	II. Upgradation of Short Circuit test facilities:	
	(A) Establishment of '350 MVA on line Short Circuit Test Station' at UHV Research Laboratory, CPRI, Hyderabad	120.00
	(B) Establishment of Short Circuit Testing of Transformers, Excitation System for existing Generator	11.00
III.	**'Establishment of New Test Facilities' under XII Plan Proposals' at an estimated cost of Rs. 356.10 Crores**	
	(A) Establishment of New Transmission Tower & Seismic Test Facility	
1	Establishment of transmission line tower test station and associated facilities	90.00
2	Augmentation of test facilities at STDS-CPRI, Bhopal	20.00

Sl. No.	Title of the Proposal	Cost (in Crores)
3	Augmentation of Pre-Qualification test facilities at CPRI, Bangalore	11.50
4	Establishment and Augmentation of Short Circuit test facilities at CPRI, Bangalore.	8.50
5	Relocation and Augmentation of Thermal Research Centre (TRC), Nagpur and Expansion of the Nagpur Unit	48.00
6	Enhancing Test Facilities of Regional Oil Testing Laboratories including Relocation of RTL, Kolkata	22.10
7	Establishment of 40 KA continuous current Temperature Rise test Facility at HPL, CPRI, Bangalore	15.00
8	Setting up of Test Facility for LV, MV & Power Cables at Western Region (Outlay : Rs.115.30 crores)	
	a) Establishment of Total Test Facility for Transformers at CPRI Western Zone	100.00
	b) Setting up of Oil Testing Laboratory in the Western Zone	5.30
	c) Establishment of Test facilities for Energy meter	10.00
9	Centre of Excellence for Non-Destructive Testing & Evaluation of Power Plant Components	8.00
10	Establishment of Phasor Measurement Unit (PMU) System Testing Calibration Lab.	6.65
11	Smart Grid Research Laboratory	11.05
IV	**Research & Development schemes of CPRI under XII Five-Year Plan**	
	A. Plan R & D (Research & Consultancy) B. Research Scheme on Power C. National Perspective Plan R &D Scheme (including UAY, IMPRINT Schemes)	15.00 20.00 45.00
	Total	**1182.00**

Physical Progress of Ongoing spill over XII Plan Capital Projects

I. Augmentation & New Facilities Project (Outlay: Rs.105.90 Cr.)

Project components:

(i) Augmentation of Energy Meter & Calibration Laboratory

Out of 75 items identified, Purchase Order has been placed for 73 Items, out of which 70 items are received and commissioned. The project will be completed by December 2018.

(ii) Augmentation of Protocol & Meter Testing Laboratory

Equipment procurement are in advanced stage. Out of 21 items identified, P.O. for 19 items have been placed. Civil work is being executed by CPWD. The project is expected to be completed by March 2019.

(iii) Establishment of test facility for (i) Solar Based Grid Tied Inverter Systems (up to 500 kVA) and (ii) Solar PV modules (upto 500 Wp)

Out of 23 items identified, 20 P.O.'s have been placed and out of which 12 items are installed. Civil works is in advanced stage. The project will be completed by December 2018.

(iv) Augmentation, Modernisation & Capacity Addition of Battery, Ingress Protection and Illumination test facilities

Out of 8 items identified, 6 items are received. Balance items are in advanced procurement stage. The project will be completed by December 2018.

II. Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment"under XII Plan, at an estimated cost of Rs. 640.00 Crores

Project components:

(i) Augmentation of High Power Short Circuit Test facilities by installation of two additional 2500 MVA Generators with associated equipment at High Power Laboratory, CPRI, Bangalore

M/s. CESI, Italy has been appointed as Global Consultant. M/s CESI, Italy has submitted its two reports. Tendering to happen in the month of June 2018 for two 2500 MVA S.C. Generators.

(ii) Establishment of 350 MVA Online Short Circuit Test station at UHVRL, CPRI, Hyderabad

M/s. CESI, Italy has been appointed as Global Consultant. M/s CESI, Italy has submitted its two reports. Tendering to happen in the month of June 2018.

(iii) Establishment of Short Circuit Testing Transformers, Excitation Systems for existing Generator

The purchase orders have been placed for all the 16 items covered under this project. Out of the 16 items, 15 items were received and installed. Pre-dispatch inspection completed for one of the pending item (Imported) and delivery of the same is expected by end of May 2018. The project will be completed by December 2018.

III. Establishment of New Test Facilities Projects

Project components:

1. Establishment of transmission line tower test station and associated test facilities

The specifications for all the items identified to be procured have been finalized for Augmentation of Tower Testing Station & Related test facilities at Bangalore (Including EVRC) – The site has been handed over to CPWD. Civil works started by CPWD in the month of Nov. / Dec. 2017 for creep test facility. The architecture drawings approved for other civil works for construction of winch houses at TTS & tender being called by CPWD . Creep test facility and UTM worth Rs. 1.0 Cr. are in advanced stage of procurement. The purchase process for augmentation of conductor vibration test system worth Rs. 1.0 Cr. & tower testing test system worth Rs. 3.50 Crore is in progress. All the procurement with reference to EVRC completed except Hydraulic Shaker System worth Rs. 10 Cr. for which order has been placed. Construction of Dynamic Lab. Building is in Progress. Establishment of Tower Testing Station at CPRI, Hyderabad-For civil work, tender floated. Preliminary Estimate done by CPWD, Hyderabad for Design & Build mode of scope. The specifications for all the items identified to be procured have been finalized.

2. Augmentation of test facilities at STDS-CPRI, Bhopal

All the items to be procured worth Rs.18 Cr. are in advanced stage of procurement. Site has been handed over to CPWD and civil work is in progress. The project shall be completed by December 2018.

3. Augmentation of Pre-Qualification test facilities at CPRI, Bangalore

Accessories for Impulse Current Generator – has been installed and commissioned. Other minor items are in advanced stage of procurement. The project will be completed by December 2018.

4. Establishment and Augmentation of Short Circuit test facilities at CPRI, Bangalore

All the items to be procured worth Rs. 8 Cr. are in advanced stages of procurement. The order for the procurement of transformer worth Rs. 1.76 cr. has been placed. S.C. Transformer will be received during September 2018. The project will be completed by December 2018.

5. Relocation and Augmentation of Thermal Research Centre –CPRI, Koradi

The registration of land required for the relocation of the unit at Nagpur has been done in the name of CPRI. Site has been handed over to CPWD and Construction of Compound wall, Guest House, Laboratories are in progress. Procurement of equipment is in advanced stage of procurement.

6. Enhancing Test Facilities of Oil Testing Laboratories and Relocation of RTL, Kolkata.

All the major oil test equipment have been procured and commissioned. The project will be completed by December 2018.

7. **Establishment of 40 kA temperature rise test at High Power Laboratory, CPRI, Bangalore**

M/s. CESI, Italy has been appointed as Global Consultant. M/s CESI, Italy has submitted its two reports. Tendering to happen in the month of June 2018

8. **(a) Establishment of total test facilities for Transformers at CPRI Western Zone**

(b) Setting up of test facilities for Oil testing Lab. at Nashik and

(C) Establishment of test facilities for Energy Meter

The registration of land at Nashik has been done in the name of CPRI. Site has been handed over to CPWD and construction of compound wall is in progress. The preliminary estimate for construction of laboratory is under preparation by CPWD. Discussion with MSEDCL for the extension of transmission line for online test facility is in progress.

9. **Setting up of Centre of excellence for Non Destructive Testing & Evaluation of power plant components**

All the equipment to be procured are in advanced stages of procurement. Out of 9 items identified, Purchase orders have been placed for 8 items. This project will be completed by December 2018.

10. **Establishment of Phasor Measurement Unit (PMU) System Testing and Calibration Laboratory**

All items to be procured including software are in advanced stage of procurement. Site has been handed over to CPWD and work is in progress.

11. **Smart Grid Research Laboratory**

All items to be procured including software are in advanced stage of procurement. Site has been handed over to CPWD and work is in progress.

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SECTION - 8

ADMINISTRATIVE MATTERS

ADMINISTRATIVE MATTERS

Governance

The following distinguished persons have joined the Governing Council and the Society of CPRI as members in 2017-18:

1) Shri Ajay Kumar Bhalla, IAS, Secretary, Ministry of Power has assumed charge as President, Governing Council of CPRI vice Shri Pradeep Kumar Pujari, IAS

2) Smt. Shalini Prasad, IAS, Additional Secretary, Ministry of Power has assumed charge as Member, Governing Council of CPRI vice Shri B. P. Pandey, IAS, Special Secretary.

3) Shri P.S. Mhaske, Member (Power System), Central Electricity Authority became the Member of CPRI Governing Council vice Shri K K Arya.

The following distinguished persons joined the Standing Committee of CPRI as Members in 2017-18:

1) Smt. Shalini Prasad, IAS, Additional Secretary, Ministry of Power has assumed charge as Chairperson, Standing Committee of CPRI vice Shri B P Pandey, IAS, Special Secretary.

2) Shri Vivek Kumar Dewangan, IAS, Joint Secretary & Financial Adviser, Ministry of Power became a Member of CPRI Standing Committee vice Dr. Pradeep Kumar, I.A.S.

3) Shri P. S. Mhaske, Member (Power Systems), Central Electricity Authority became a Member of CPRI Standing Committee vice Shri K K Arya.

During the course of the year, the 80th Standing Committee Meeting of CPRI was held on 1st November 2017 & 82nd Governing Council Meeting of CPRI and 40th Annual General Meeting was held on 20th December 2017 at Ministry of Power, New Delhi to consider various issues pertaining to the Institute.

Important Events:

1) Hon'ble Minister of State for Power, Coal, New & Renewable Energy and Mines (I/c.) Shri Piyush Goyal visited CPRI, Bangalore, on 6th June 2017 for a review of CPRI activities and addressed senior officers of CPRI before making brief visit to a few Laboratories like High Power Laboratory, High Voltage Laboratory, Earthquake Engineering & Vibration Research Centre, and Energy Efficiency & Renewable Energy Division.

Visit of Hon'ble Minister of State for Power, Coal, New & Renewable Energy and Mines (I/c.) Shri Piyush Goyal to High Power Laboratory, CPRI, Bangalore

2) Director General-CPRI attended the 45th meeting of the Board of Directors of NHPTL, held at NHPTL, New Delhi, on 27th April 2017.

3) Director General -CPRI attended the First Indo-Japan Government-Private Workshop for Clean Energy and Energy Efficiency, held at New Delhi, on 12th October 2017.

4) Meeting of Technical Committee of Research

a) The 4th Meeting of Technical Committee on Hydro Research of CPRI was held at CCAR Meeting Room, CPRI, Bangalore, on 16th June 2017. The meeting was chaired by Dr. B K Gandhi, Professor, IIT, Roorkee. Members from CEA, NHPC participated in the meeting. Progress of ongoing projects was reviewed.

b) The 4th Meeting of Technical Committee on Transmission Research of CPRI was held at CCAR Meeting Room, CPRI, Bangalore, on 19th June 2017. The meeting was chaired by Dr. S C Srivastava, Professor, IIT, Kanpur. Members from CEA, POWERGRID participated in the meeting. Progress of ongoing projects was reviewed.

c) The 5th Meeting of Technical Committee on Grid, Distribution & Energy Conservation Research of CPRI was held at CCAR Meeting Room, CPRI, Bangalore, on 20th June 2017. The meeting was chaired by Dr. S V Kulkarni, Professor, IITB-Mumbai. Members from CEA, TANGEDCO participated in the meeting. Progress of ongoing projects was reviewed.

d) The 4th Meeting of Technical Committee on Thermal Research of CPRI was held at CCAR Meeting Room, CPRI, Bangalore, on 21st June 2017. The meeting was chaired by Dr. R P Vedula, Professor, IITB-Mumbai. Members from CEA, TATA POWER, and NTPC (NETRA) participated in the meeting. Progress of ongoing projects was reviewed.

Signing of MoUs

A Memorandum of Understanding (MoU) was signed between Ministry of Power & Central Power Research Institute on the key performance parameters proposed for the financial year 2017-18, on 17th November 2017.

A Memorandum of Understanding (MoU) was signed between Bureau of Energy Efficiency (BEE) and CPRI for "Establishment of testing facilities for LEDs and other appliances/equipment" on 5th September 2017.

Mechanical Engineering Division

CPRI signed contract with POWERGRID during June 2017 Turnkey project of Tower testing for 3 Nos. of ± 320 kV & ± 800 kV HVDC Towers, associated with HVDC Bi-Pole link between Region (Raigarh, Chhattisgarh) & Southern region (Pugalur – TN) – North Trichur (Kerala) – Scheme 1: Raigarh – Pugalur 6000 MV HVDC & Scheme 3: Pugalur – Trichur 2000 MV VSC based HVDC system. Value of contract was Rs. 3.0278 crore and execution of contract completed.

Deputation of CPRI officers overseas

The officers of CPRI were deputed to attend various overseas assignments such as Short Circuit Testing Liaison Meetings, Pre-dispatch Inspection for Quality Clearance, Conferences and Training Programmes. **The details of these overseas assignments are provided in Appendix-8.**

Institute Day Celebration

1) The Institute Day was celebrated at CPRI, Bangalore, on 16th January 2018. Smt. T. K. Anuradha, Programme Director, GEOSAT, ISRO Satellite Centre, Bangalore the Chief Guest of the function delivered Jawaharlal Nehru Birth Centenary Memorial Lecture on 'Innovative steps-ISRO Way' on the occasion. Shri V. S. Nandakumar, Director General-CPRI presided over the function. Mylavarapu Subbalakshamma Award was awarded to Smt. K P Meena, Joint Director, CPRI, Bangalore being the best Lady Scientific/Engineering Officer for the most significant work done by her during the year 2017. This award is constituted by our former Director General Dr. M. Ramamurthy, for the best lady scientist of the year. Shri B. M. Naidu Award for the best research paper of the year based on testing clues/data, was awarded to Shri T. Mallikharjuna Rao, Joint Director, CPRI, Bangalore, for the Paper titled "Coal washing: A sustainable approach towards Green Environment", presented in 5th International Conference on "Coal Washing: A sustainable approach towards Green Environment", held at New Delhi, on 6th & 7th November 2017.

From Left to Right: Shri R. A. Deshpande, Additional Director, CPRI, Shri V. S. Nandakumar, Director General-CPRI, the Chief Guest Smt. T. K. Anuradha, Programme Director, GEOSAT, ISRO Satellite Centre, Bangalore and Dr. R. Ramesh Babu, Director, CPRI, Bangalore

Smt. K P Meena, Joint Director, CPRI, Bangalore receiving the Mylavarapu Subbalakshamma Award from the Chief Guest

Shri T. Mallikharjuna Rao, Joint Director, CPRI, Bangalore receiving Shri B.M. Naidu Award from the Chief Guest

2) The **Institute Day** was celebrated at STDS-CPRI, Bhopal, on 16th January 2018. The programme was presided over by Chief Guest Shri D. K.Thakur, Executive Director, BHEL, Bhopal. The Chief Guest Shri D. K.. Thakur, Executive Director touched upon the history of BHEL and its services & relationship existing between CPRI and BHEL in testing of Switchgear products and Transformers and further he praised CPRI for its unique test facilities and its vital contribution in operating and managing of NHPTL at Bina where testing of BHEL's Large Power Transformers highlighting the first transformer successfully tested in NHPTL, Bina was from BHEL, Bhopal. Shri Rajeev Agrawal, Industrialist & Motivational Guru was the Guest of Honour. The guest of honour Shri Rajeev Agrawal enlightened the gathering by his motivational talk on human relationship relieving egoism and facing challenges in office and home. The programme was attended by all the Employees, Associates, Trainees and Guests from M/s. BHEL, Utilities, MPMKVVCL, Bhopal, MANIT Bhopal, Institution of Engineers & Clients from Bhopal.

Institute Day Celebrations at STDS-CPRI, Bhopal

3) UHVRL, CPRI, Hyderabad celebrated **INSTITUTE DAY** on 16th January 2018. Shri G. Narsing Rao, Director, Projects & Grid Operation, T S Transco, Hyderabad was the Chief Guest of the function. He delivered a technical talk on "Challenges in implementation of projects in HV Transmission lines and Power scenario" on the occasion.

Institute Day Celebrations at UHVRL-CPRI, Hyderabad

4) Institute Day celebration was organized at RTL-CPRI, Noida, on 16th January 2018. Chief Guest of the function was Shri Pankaj Batra, Member (Planning), Central Electricity Authority, New Delhi. Guest of Honor was Shri A. K. Rajput, Chief Engineer, Central Electricity Authority, New Delhi. All Staff members of the Unit along with their family members attended the function.



Institute Day Celebrations at RTL-CPRI, Noida

Other events are as follows:

- For the first time, STDS-CPRI, Bhopal organized 15th Asian Meeting of High Power Laboratories on 14th & 15th December 2017. During this meeting 18 nos. of delegates viz; 6 from Japan, 5 from South Korea and 7 from China participated. The overseas participants visited all the laboratories of STDS, Bhopal on 15th December 2017.

Delegates of the 15th Asian Meeting of High Power Laboratories

- Inspection was conducted by Parliamentary Sub Committee on Rajbhasha about implementation of Hindi Language in Office Procedures. Twelve member committee comprising of three MPs, Under Secretary & Research Officer of the Ministry visited CPRI, Bhopal from 1st to 3rd July 2017. This inspection was conducted for ten offices in Bhopal City.

Committee members of the Parliamentary Sub Committee on Rajbhasha about implementation of Hindi Language in Office Procedures, -Inspection at STDS-CPRI, Bhopal

Activities Related to Women Employees

CPRI has implemented Internal Policy for Prevention, Prohibition and Redressal of Sexual Harassment of Women at Workplace and a circular to this effect is uploaded on the website.

The Women's Cell looks after the following:

- Welfare of the women employees of the organization.
- Caters to the issues/ grievances concerning women employees and facilitates redressal of the same.
- Management of the Creche in the CPRI Staff colony and provides necessary guidelines for its smooth functioning.

The internal complaints committee of Womens cell investigates (as per CPRI's Internal Policy for Prevention, Prohibition and Redressal of Sexual Harassment of Women at Workplace) reported cases if any in CPRI of commission of acts of sexual harassment of women and submits its report to the disciplinary authority recommending action to be taken against the accused employees.

There was one case of sexual harassment reported during the year 2017 for which investigation was carried out and suitable action taken by the internal complaints committee of Womens cell to resolve the same within the stipulated time as per CPRI's internal policy.

The Womens cell celebrates 'International Women's Day' every year during the month of March/ April during which eminent women personalities are invited to deliver lectures on the subject related to women.

Statement indicating total number of employees in the Institute and number of women employees in each category, as on 31st March 2018

Sl.No.	Post(s)	No. of employees	No. of women employees	Percentage of women employees
1	Director General	1	-	-
2	Director	1	-	-
3	Additional Director	25	2	8.00
4	Joint Director	46	4	8.70
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer	1	-	-
7	Scientists/Engg. Officers	117	20	17.09
8	Scientists/Engg. Assistants	24	2	8.33
9	Non-Tech. Officers	13	3	23.08
10	Office Staff/Stenographer	96	36	37.50
11	Library staff	-	-	-
12	Technicians	69	-	-
13	Technical Attendant/Attendant	75	4	5.33
14	Drivers/Cook-cum-Care taker	10	-	-
15	Multi-Tasking Staff	36	5	13.89
	Total	**515**	**76**	**14.76**

Staff strength of the Institute as on 31st March 2018

Sl.No.	Posts	Number of employees
1	Director General	1
2	Director	1
3	Additional Director	25
4	Joint Director	46
5	Chief Administrative Officer (SG)	1
6	Chief Accounts Officer	1
7	Scientific/Engg. Category	141
8	Technicians	69
9	Administrative & Supporting Staff	155
10	Supporting Technical Staff	75
	Total	**515**

Vigilance Activities

Shri Birendra Kumar, IA & AS, Chief Vigilance Officer of Power Finance Corporation has been assigned additional charge as CVO of CPRI by Ministry of Power since July 2016.

'Vigilance Vision' of CPRI is preventive over punitive actions, to enforce meaningful, workable and objective systems/procedures, to develop trust and transparency in all transactions, to prevent financial or other losses due to any malpractices, to promote pride and self-esteem of the Organization and its employees and time bound action in all spheres of activities.

Several system Improvements have been undertaken with IT usage and web enabled technologies like booking of test dates online on CPRI website. Technology communication with customers through emails, payment of test and consultancy fees through wire transfer, RTGS, e-tendering, posing of formats for submission of research proposals, project reports in CPRI website. Transparency in all the technical, financial and administrative activities of CPRI is also ensured.

Vigilance Awareness Week with "My Vision-Corruption Free India" as its central theme was observed in CPRI, Bangalore and at its Units from 30th October 2017 to 4th November 2017. "Integrity Pledge" was administered to all the employees of Head Office and Units at 11 A.M on 30th October, 2017. Banners on Vigilance Awareness Week were displayed at prominent locations at Head Office and the Units of CPRI. Background of the theme of Vigilance Awareness week -2017 was displayed on the web page of CPRI and hyperlink for Integrity Pledge was provided in CPRI website. All the employees of CPRI took e-pledge using the hyperlink provided in the website as per the directives of CVC. Pamphlets on "Vigilance Awareness Week-2017" were distributed among the employees and also circulated on e-office of CPRI. Pamphlets were also displayed on Notice Boards in all Divisions and Sections.

Observance of the "Vigilance Awareness Week" concluded on 3rd November, 2017 (3rd being the last working day of the week) with an invited talk by Smt. C Saraswathi, Additional General Manager (Vigilance), Hindustan Aeronautics Limited, Bengaluru, who was the Chief Guest. The function was presided over by the Director General, CPRI. The Chief Guest in her address emphasized vigilance awareness in day to day functioning of the Institute and using it as a preventive mechanism rather than punitive so as to create a positive environment which is an enabler for taking decisions. All the officers, staff of the Institute attended the function. A compliance report on observance of "Vigilance Awareness Week" at CPRI was also submitted on 7th November 2017.

Rotational Transfer Policy of CPRI was implemented and a circular to this effect is uploaded on the website. CPRI has also formulated a policy on Agreed and ODI list and Officials with Doubtful integrity are being reviewed. CPRI has also been furnishing the requisite reports under provision of Probity among Government Servants to Ministry of Power on monthly basis.

Vigilance Cases

Two Vigilance cases are under process during the year 2017-18 for which the Disciplinary Authority is the President, CPRI-Governing Council.

Information on RIGHT TO INFORMATION ACT

The RTI cell functions with Dr. R. Ramesh Babu, Director as Appellate Authority, Shri M. Janardhana, Joint Director as Central Public Information Officer (CPIO) and Shri Kishore Kumar, Engineering Officer Gr-4, CPRI, Bangalore as Central Assistant Public Information Officer (CAPIO) and Nodal officer.

During the financial year 2017-18, the RTI cell has received 63 number of applications on various subject matters, which are summarized as below :

Sl. No.	Subjects	No. of applications received	No. of applications replied	No. of CIC hearing attended	Remarks
1.	Recruitment & Posts	27	27	1	Nil
2.	Test facility	8	8	1	
3.	Service matters	12	12	2	
4.	Tender	2	2	Nil	
5.	Planning & Projects	6	6	1	
6.	Civil works	2	2	1	
7.	Other (Safety, Power plant, Power supply/Substation/ Report)	5	5	Nil	
8.	Forwarded application to other CPIO	1	1	Nil	
Total RTI applications		63	63	6	

CPRI -RTI cell uploaded the quarterly reports for April –June 2017, July-September 2017, October-December 2017, and January-March 2018 and Annual report 2016-17 timely on CIC web site and CPRI web site.

The RTI cell has provided information for all the RTI applications received during the financial year 2017-18 with in the time period.

Liaison Officer for SC / ST & PWD Welfare Activities

Activities relating to Liaison Officer SC/ST & PWD & OBC Welfare Activities:

Smt J. Sreedevi, Joint Director and Shri D. Revanna , Joint Director, CPRI, Bangalore served as Liaison Officers for SC/ST & PWD and OBC respectively during the year 2017-18. Reservation registers and Roster registers were updated for the year 2017-18.

Dr. B. R. Ambedkar's 126th Birth Anniversary was celebrated at CPRI, Bangalore, on 14th April 2017. A grand official function was organized to commemorate the Birth Anniversary of Dr. B.R. Ambedkar at CPRI, Bangalore, on 9th August 2017. Professor V. Sudesh, Principal and Head of the Post Graduate, Dept. of studies in Law, University Law College, Bangalore University was the Chief Guest and Shri Hoddy Venkatesh, Renowned Social worker, Ambedkar Vada was the Guest of Honor and the function was presided by Director General-CPRI Shri V. S. Nandakumar.

On this august occasion, Management of CPRI distributed the meritorious awards to the children of CPRI employees who topped in 10th and 12th standards in the categories of SC/ST, OBC & General. As part of the 126th celebrations sweets were distributed to employees and cultural program was organized. In this connection, a blood donation camp in association with M/s. K C General Hospital, Malleswaram, Bangalore was also organized on 7th August 2017.

Dr. B. R. Ambedkar's 126th Birth Anniversary celebration at CPRI, Bangalore

Distribution of awards for the meritorious children of CPRI employees who topped in 10th and 12th standards on the occasion of Dr. B.R. Ambedkar's 126th Birth Anniversary celebration at CPRI, Bangalore

Representation of Scheduled Caste, Scheduled Tribe & OBC as on 31st March 2018

Group	Total	SC	ST	OBC	Others
A	**197**	44	18	34	101
B	**136**	31	25	18	62
C	**146**	42	17	30	57
MTS	**36**	16	3	2	15
Total	**515**	**133**	**63**	**84**	**235**
Percentage	-	25.83	12.23	16.31	45.63

Representation of Physically Challenged Employees as on 31st March 2018

Sl.No.	Post(s)	No. of employees	No. of physically challenged employees	Percentage of physically challenged employees
1	Director General	1	-	-
2	Director	1	-	-
3	Additional Director	25	-	-
4	Joint Director	46	-	-
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer	1	-	-
7	Scientists/Engg. Officers	117	6	5.13
8	Scientists/Engg. Assistants	24	1	4.17
9	Non-Tech. Officers	13	1	7.69
10	Office Staff/Stenographer	96	3	3.13
11	Library staff	0	-	-
12	Technicians	69	-	-
13	Technical Attendant/Attendant	75	5	6.67
14	Drivers/Cook-cum-Care taker	10	-	-
15	Multi-Tasking Staff	36	-	-
	Total	**515**	**16**	**3.11**

Public & Staff Grievance Cell

Central Power Research Institute has a separate cell for redressing the staff and public grievances. The Grievance Redressal Mechanism is a part and parcel of the machinery of CPRI administration. The role of Public and Staff Grievance Cell is primarily to assist the management in redressing the staff and Public grievance petitions. The grievance received by the department

are forwarded to the concerned Section who are dealing with substantive function linked with the grievance for redressal under intimation to the complainant. The complaints are either received in person, by post, Fax, e-media or through online CPGRAMS portal. CPRI web portal has direct link to CPGRAMS portal www.CPGRAMS.IN The CPGRAMS offers to the staff and public, the facility of lodging online grievances, on-line reminders and online view of current status of the grievances. The guideline indeed is that the CPRI deal with every grievance in a fair, objective and just manner. The monitoring of grievances received and disposed of by CPRI under Public & Staff Grievances officer is on a regular basis.

During the year 2017-18 CPRI has redressed several grievance petitions including 19 online grievance petitions both from the staff and general public on matters related to pension, recruitment and promotion policies, medical and staff welfare measures. Suggestions, comments made by the general public have been appreciated and replied.

Summary of online grievance received and disposed

Grievance Source	B/F Balance	Receipt During the Period	Total Receipts	Cases Disposed of During the Period	Closing Balance as on 31/03/2018	Yet to Assess	At Our Office
Local/ Internet	0	11	11	10	1	0	1
PMO	0	8	8	7	1	0	1
Total	0	19	19	17	2	0	2

CPRI Library and Information Centre, Bangalore

CPRI Library and Information Centre is a special library in the field of power engineering and was established in the year 1960. It provides information services to the employees of the organization and the research scholars.

Number of Publications acquired during the year 2017-18:

The total number of members are 181 and during the year 3 new members were added. Total stock is 35,672 and 199 publications were added during the year. Total number of journals subscribed during the year is 64. Out of 64, foreign journals are 27, Indian journals are 28 (all are technical reference publications), Hindi journals are 3, Journals on membership are 5, online journal is 1, 7 newspaper and 6 general reading magazine.

CPRI Library and Information Centre has been downloading IEC Standards since 2003. During the year, 09 standards were downloaded and uploaded in the CD/DVD server. Indian standards, ASTM complete set 2016 and Electra 1967-2000 are available on Intranet.

Classification scheme and arrangement:

Books were classified according to UDC scheme of classification and arranged according to classification number in the Book Section. Bound volumes were arranged alphabetically in the Bound Volume Section. Standards, Reports, Technical Reports were arranged according to numbers in the Standards Section. Current periodicals are arranged subject wise.

Library and Information Centre is situated near the Dr. M. Ramamoorty Block and spread over in two floors. Library and Information Centre is completely automated and is using KOHA software with WEB OPAC with unlimited users. All in-house operations are done through the software. Readers can access the library through OPAC, CD/DVD server and Digital Library on their desktops.

New Services:

Library and Information Centre started Article Indexing of IEEE Journals procured during he year. Library and Information Centre is educating the readers on the use of WEB OPAC, CD/DVD server and Digital Library and Knowledge Management Systems and also providing reprographic services to the users.

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SECTION - 9

FINANCE & ACCOUNTS

Finance & Accounts

The Institute has done well in its financial performance during the year 2017-18 and earned revenue of Rs.191.05 Crores

Revenue earnings during the past five years

Year	Revenue (Amount in Crores)
2017-2018	191.05
2016-2017	183.85
2015-2016	159.20
2014-2015	167.27
2013-2014	159.97

Increased services rendered to the Utilities and Industries are well reflected in the financial performance raising the revenue earnings from Rs. 15996.60 lakhs in 2013-2014 to Rs. 19104.61 lakhs during the current year. During the year under report, as against the revenue realization of Rs.19104.61 lakhs, the expenditure on non-plan activities stood at Rs.19003.59 lakhs resulting in a surplus of Rs.101.02 lakhs. For the 29th year in succession, the Institute has not drawn any Non-Plan Grant-in-Aid from the Government of India.

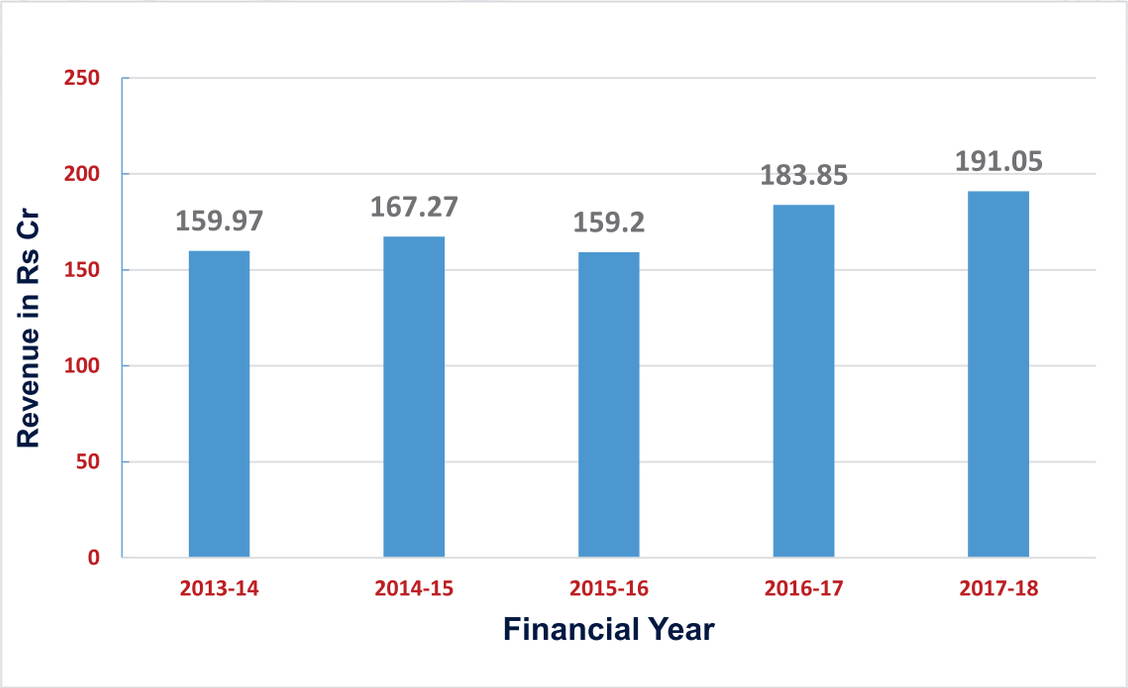
During the year, the expenditure under various heads has been as follows:

Non Plan Expenditure	Rs. 19003.59 lakhs
Plan R & D Expenditure	Rs. 1111.16 lakhs
Plan Capital Expenditure	Rs. 7492.70 lakhs
RSoP Schemes	Rs. 163.34 lakhs
NPP Schemes	Rs. 635.41 lakhs

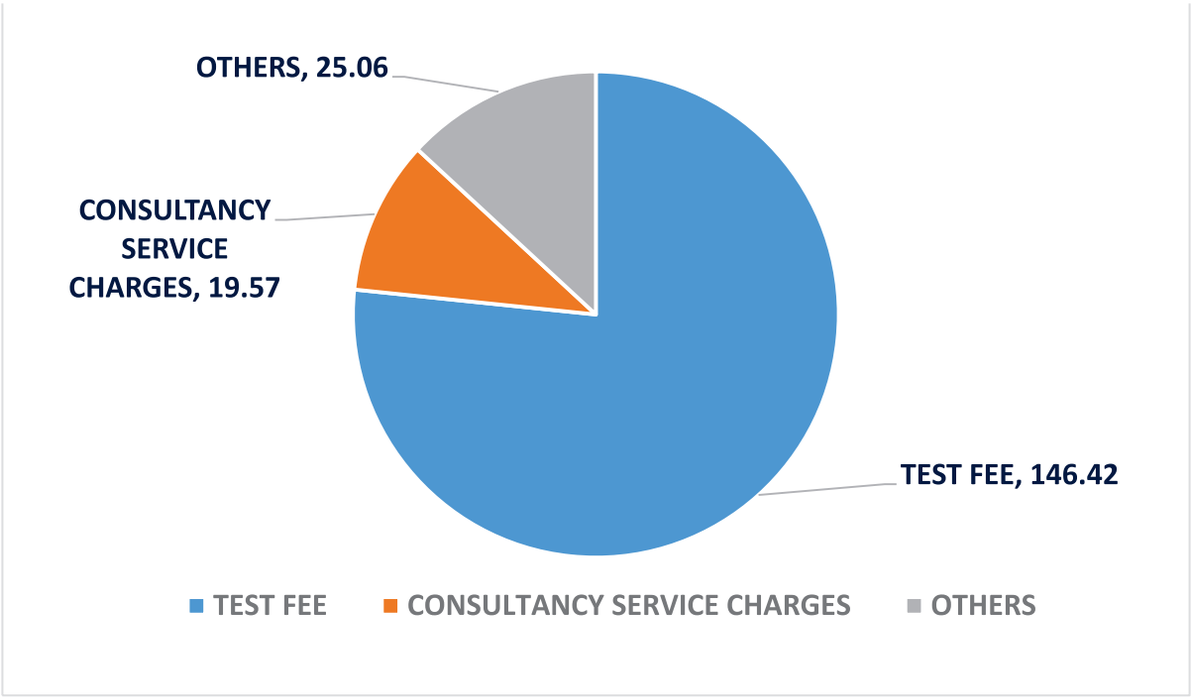
The Institute received grants-in-aid (Plan) of Rs. 5035.84 lakhs from the Government of India during the year. The details along with Auditors Report are furnished in Appendix – 11.

As at the end of March 2018, the capital investment by the Government of India on the Institute has been Rs. 88594.29 lakhs.

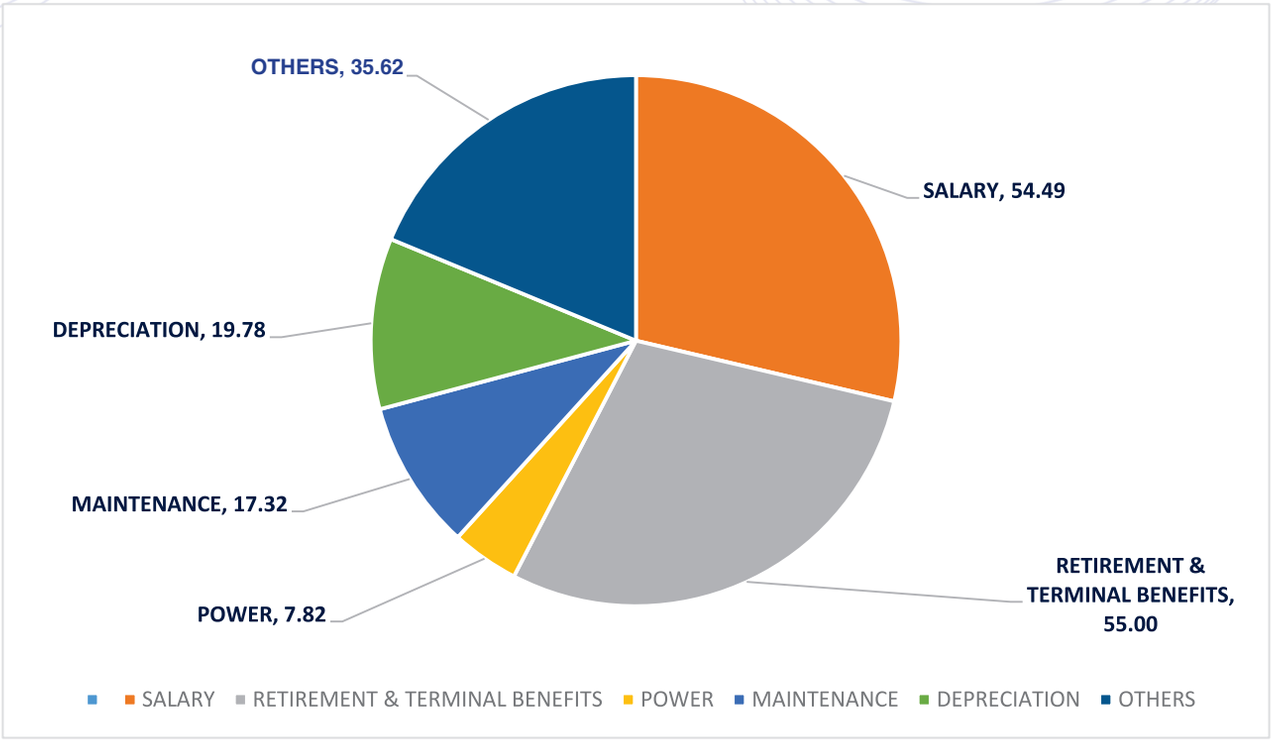
REVENUE EARNINGS DURING THE PAST FIVE YEARS (Rs. in Crores)



REVENUE DURING 2017-18 UNDER MAJOR HEADS (Rs. in Crores)



EXPENDITURE DURING 2017-18 UNDER MAJOR HEADS (Rs. in Crores)



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SECTION - 10

ACTIVITIES IN OFFICIAL LANGUAGE : HINDI

ACTIVITIES IN OFFICIAL LANGUAGE : HINDI

Remarkable achievements of the Institute in the field of Official Language Implementation during the year 2017 – 18 are listed below:

1. Awards

(A) Rajbhasha Keerthi Puraskaar

The Prestigious Rajbhasha Keerthi Puraskaar - First: The Hon`ble President of India, Shri Ram Nath Kovindji presented the Prestigious Rajbhasha Keerthi Puraskaar - First to Shri V.S. Nandakumar, Director General, CPRI for the excellent work in the field of Official Language Implementation during the year 2016-2017 for offices in Region 'C ' on the occasion of Hindi Divas, held at Planery Hall, Vigyan Bhavan, New Delhi, on 14th September, 2017. This is the Twelfth Award won by CPRI so far and this has been bagged for the eighth time consecutively.

D.G., CPRI receiving the Prestigious Rajbhasha Keerthi Puraskaar – First from the Hon`ble President of India, Shri Ram Nath Kovindji

(B) A Joint Official Language Conference of West and Central Region was organized by the Department of Official Language, Ministry of Home Affairs, Government of India, at Mumbai on 12th January 2018. In this Conference, Governer of Maharashtra Shri C. Vidhyasagar Rao has given second position award to STDS-CPRI, Bhopal, for the best performance in the Official Language –Hindi, which was received by Shri J. Santhosh, Unit Head/Additional Director, STDS-CPRI, Bhopal.

Shri J. Santhosh, Unit Head/Additional Director, STDS-CPRI, Bhopal receiving the award for the best performance in the Official Language –Hindi during the Joint Official Language Conference of West and Central Region

2. Seminars and Workshops

A. Health Talk in Hindi (Homeopathy):

A Health Talk in Hindi on "Importance of rhythm in life and health" was delivered by Dr Sheeja Medhar, BHMS, at CPRI, Bangalore, on 20th June 2017 which had interactive sessions with active participation of officers/employees that benefitted the audience who gathered in large numbers.

B. Health Talk in Hindi (Alopathy):

A Health talk on ***"Women's Health and Nutrition"*** was arranged for the officers/employees of the Institute, at CPRI, Bangalore, on 13th December 2017. About 22 women officers and employees participated in this informative programme followed by an interactive question answer session. Smt. Archana Reddy, Nutritionist and Dietician and Dr. Madhushree from Motherhood Hospital, Sahakar Nagar, Bangalore spoke at length on Women's health. The Programme was a big success with all queries getting answered by the competent doctors.

C. Hindi Workshop

One day Hindi Workshop was organized on the following topics for the Technical and Ministerial staff of the Institute in the CCAR auditorium, CPRI, Bangalore, on 21st February 2018:

1. Role of Higher Officers in OL Implementation.
2. Problems confronted in OL Implementation and measures to be undertaken.
3. Use of Hindi IT tools.

The faculty for this workshop was drawn from Central Govt. Organisations viz. Dr. S. N Mahesh, Senior Hindi Translator, Centre for Artificial Intelligence and Robotics, Bangalore and Shri M. P. Damodaran, Dy. Director (OL), Coffee Board, Bangalore.

The workshop witnessed the enthusiastic participation of more than 50 Officers/ Employees.

D. Workshop on "Speech to text software"

A workshop on "Speech to text software" was organized for the Ministerial Staff on 25th July 2017 at CCAR auditorium, CPRI, Bangalore. The workshop was conducted by Dr. S.N Mahesh, Senior Hindi Translator, Centre for Artificial Intelligence and Robotics, Bangalore. Around 35 employees were trained in this workshop. Headphones to all these employees were issued in order to facilitate them for working.

3. Celebration of Hindi Month and Hindi Divas

The Hindi Month was observed at CPRI, Bangalore from 28th August 2017 to 5th September 2017. Various competitions such as Quiz, Anthakshari, Vocabulary, Dictation, Hand writing and News reading, Humorous Conversation, Hindi Song, Memory Test, Who am I? etc. were

Organized as a part of the Hindi Month celebrations. Hindi Divas was celebrated at CPRI, Bangalore, on 22nd September 2017. Smt. Sulekha Mohan, Deputy General Manager-OL (Retd.), Canara Bank, Bangalore was the Chief Guest of the function. Prizes were distributed to the winners of various competitions. Cash Awards were given to the winners under the

Incentive Scheme for Original Noting and drafting in Hindi and to the winners of Technical Article Competition. A cultural programme was presented on this occasion by the In-house talent of CPRI which was appreciated by one and all.

Hindi Divas celebrations at CPRI, Bangalore

4. Important documents to MoP were sent in Bilingual

(i) Background note on the measures undertaken to secure presentations of OBCs in employment and for their welfare in CPRI.

(ii) CPRI profile for the website of MoP.

5. Advertisement in Bilingual

a. The Advertisement for the posts of SRF/JRF released by R&D Deptt. was brought out in bilingual.

b. CPRI Advertisement in "Anupam Rashtra" has been published in bilingual.

6. Revised purchase formats in Bilingual

The revised purchase formats were brought out in Bilingual.

7. MoU between MoP & CPRI for the year 2017-18

The MoU between MoP & CPRI for the year 2017-18 was prepared in bilingual.

8. O L Inspection

Shri Tekchand, Dy, Dir (Impl.) inspected CPRI, Bangalore, on 26th February 2018 to assess the implementation of O.L. in the Institute.

9. Publications

A. Annual Report:

The Annual Report of the Institute is published in bilingual every year. Annual Report for the year 2016-17 was published in English and Hindi separately.

B. CPRI News:

Four issues of the quarterly magazine of the Institute "CPRI News" are brought out in bilingual.

C. STDS Darpan:

The 19th edition of the In-house magazine of the Institute's Bhopal unit "STDS Darpan" was published in Hindi.

D. Rajbhasha Samachaar:

The fifth edition of Rajbhasha Samachaar 2017–18 which is the compilation of all the activities of Official Language in the Institute was brought out successfully.

10. Awards under Incentive Scheme

A. Noting and Drafting in Hindi

Various incentive schemes are in vogue in the Institute viz., Noting and Drafting, Prizes under these categories are distributed every year on the occasion of Hindi Divas.

B. Annual Technical Article Competition

Technical Article Competition for the year 2017-18

To promote Hindi writing in Technical field, the Institute is organizing an Annual Technical Article Competition for the past 23 years for the Scientists of all Central Govt. Organizations. The following best three articles were awarded prizes on Hindi Divas, held on 22nd September 2017:

First Prize	:	ISRO Satellite Centre, Deptt. of Space, Bangalore
Second Prize	:	Central Power Research Institute, Bangalore
Third Prize	:	Centre for Artificial Intelligence and Robotics, Bangalore

11. Facilities Provided

A. Learn 'A Word A Day' Scheme:

A new Hindi word per day with its English equivalent are displayed on the boards put up at the Main Gate and Head Office at CPRI, Bangalore.

B. Learn "Ten words a Month" Scheme

Under "Learn and use Ten Hindi words per month scheme", Ten Hindi words with their English equivalents are released every month and all are requested to use these words in their day-to-day official work during the said month.

C. English-Hindi phrases printed on folders:

The file folders used in the Institute contains 40 English-Hindi phrases and 40 English-Hindi synonyms printed on each side so that every employee who does desk work can easily access the ready reckoner list of Hindi words and phrases.

D. Supply of Forms:

Three kinds of forms (Hindi / Hindi–Kannada/ Hindi–English) are used in the Institute and are uploaded in CPRI Website.

(i) 64 different types of forms of the Institute are available in Bilingual.

(ii) Only Hindi forms are issued to employees possessing the working knowledge of Hindi.

(iii) Hindi-Kannada forms are issued to 'C' Category employees.

E. Brochures of Seminar in Bilingual:

The brochures of all Seminars/ Conferences/ Workshops/ Training Programmes conducted in the Institute are prepared in Bilingual.

F. All Invitation Cards in Bilingual:

All Invitation cards regarding the programmes of the Institute are prepared in Bilingual.

G. Web Site:

The web site of the Institute is available in Bilingual and is being updated from time to time.

12. TOLIC Activities

1. CPRI successfully sponsored and organized a Hindi Cross Word Puzzle Competition on 12th October 2017 for the member offices of TOLIC. There was an over whelming response from the participants. Cash prizes amounting to Rs.4,600/- were given to the winners on the occasion of Joint Hindi Divas, held on 27th November 2017 at GPO, Bangalore.
2. Dr. Amit Jain, Joint Director and Shri Phalachandra M.R, Senior Personal Assistant, CPRI, Bangalore who won in the Inter-Organizational Hindi Competitions were felicitated in the Joint Hindi Divas Samaroh, held at GPO, Bangalore, on 27th November 2017.

Smt. Sharadamani, Senior Hindi Officer, CPRI, Bangalore attended the Liaison Officer – O.L. meeting held at Dr V. M. Ghatge Convention Hall , HAL, Bangalore, on 14th March, 2018.

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SECTION - 11

APPENDICES 1 TO 11

Appendix – 1

The Members of Standing Committee as on 31st March 2018

Sl. No.	Present incumbent/Nominee	Status
1	Additional Secretary Ministry of Power Shram Shakti Bhawan Rafi Marg, New Delhi - 110 001	Chairman
2	Shri P. S. Mhaske Member (Power System) Central Electricity Authority Sewa Bhawan R. K. Puram, New Delhi – 110 066	Member
3	Shri Raj Pal, IES Economic Adviser Ministry of Power Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Member
4	Shri Vivek Kumar Dewangan, IAS Joint Secretary & FA, Ministry of Power Shram Shakti Bhawan Rafi Marg, New Delhi – 110 001	Member
5	Shri V. S. Nandakumar Director General Central Power Research Institute Post Box No. 8066 Bangalore – 560 080	Member - Convener

Appendix-2

THE MEMBERS OF COMMITTEE ON TESTING & CERTIFICATION AS ON 31ST MARCH 2018

CHAIRPERSON

Member (Power Systems)
Central Electricity Authority, Sewa Bhavan, R. K. Puram, NEW DELHI - 110 066

MEMBERS

Prof. G.R. Nagabhushana Prof. Emiretus(Retired) Deptt. of High Voltage Engg. Indian Institute of Science,IISc. (Post) Bangalore - 560 012	Shri D.K.Aggarwal Scientist F and Head, Bureau of Indian Standards Peenya Industrial Area, 1st Stage Tumkur Road, Bangalore - 560 058
Shri A.K. Gupta Executive Director(Engineering) NTPC Ltd., Engineering Office Complex Sector-24, Noida - 201301 (UP)	General Manager, QA Vijay Electricals Ltd., Somajiguda, Hyderabad – 500 082
General Manager Electroporcelains Division Bharat Heavy Electricals Ltd., Prof. C.N.R Rao Circle opp IISC,Malleshwaram, Bangalore - 560 012	Member (Commercial) West Bengal State Electricity Distribution Company Ltd., Vidyut Bhavan, Block – DJ Sector – II Bidhannagar, Kolkatta - 700 091
Shri. P. Bhaskar Technical Director Karnataka Power Corporation Ltd. # 82, Shakthi Bhavan, R.C.Road, Bangalore - 560 001	Shri P. Narasimha Murthy Retd. Chairman Karnataka Power Transmission Corpn. Ltd., No. 817, 6th Cross, MCR Layout, 5th Main Vijayanagar, Bangalore - 560 040
Head (Product Development) Siemens Ltd., M.V.Switchgear & Switch Boards P.B. No. 85, Thane Belapur Road Thane - 400 601	Executive Director W.S.Test Systems Pvt. Ltd. 27th KM, Bellary Road, Doddajala Post Bangalore – 562157
Shri.Sunil Misra Director General, Indian Electrical & Electronics Manufacturers Association # 501, Kakad Chambers #132, Dr. A. Besant Road, Mumbai - 400 018	Business Technology Leader GE PCTDC, II Floor, III Phase, John F. Welch Technology Centre Pvt. Ltd. # 52, Export Promotion, Industrial Park, Phase II, Hoodi Village, Whitefield, Bangalore - 560 066
Shri.N.Ravi Kumar Executive Director, Southern Region Transmission System – II, Power Grid Corporation of India, Sahakara Bhavana, # 32, Race Course Road, Bangalore - 560 001	Shri V. S. Nandakumar MEMBER - CONVENER Director General Central Power Research Institute Prof. C.V. Raman Road, P. B. No. 8066, Sadashivanagar P.O., Bangalore - 560 080

Appendix – 3

The Members of Standing Committee on Research & Development (SCRD) as on 31st March 2018

Sl. No.	SCRD - Main Committee	Name	Position
1	Chairperson (I/c), Central Electricity Authority, New Delhi	Shri Ravindra Kumar Verma, Chairperson I/c, C.E.A.	Chairman
2	Joint Secretary & FA, Ministry of Power, Govt. of India	Shri Vivek Kumar Dewangan, IAS Joint Secretary and FA, MoP	Member
3	Economic Adviser & Joint Secretary (I/C) of R&D, Ministry of Power, Govt. of India	Shri Raj Pal, IES Economic Adviser Ministry of Power, Govt. of India, Shram Shakti Bhawan, New Delhi – 110 001	Member
4	Member Planning (R&D) Central Electricity Authority, 3rd Floor, Sewa Bhavan, R K Puram, Sector -1, New Delhi – 110 066	Shri Pankaj Batra Member (Planning) C.E.A.	Member
Chairman of all Technical Committees			
5	(a) Hydro Research	Prof. B. K. Gandhi Mechanical & Industrial Engineering IIT, Roorkee – 247 667	Member
6	(b) Transmission Research	Prof. S. C. Srivastava, Department of Electrical Engineering Indian Institute of Technology Kanpur – 208 016	Member
7	(c) Thermal Research	Prof. R. P. Vedula, Department of Mechanical Engg. IIT-B, Powai, Mumbai - 400 076	Member
8	(d) Grid, Distribution & Energy	Prof. S. V. Kulkarni, FINAE Professor Department of Electrical Engg., IIT-Bombay, Powai, Mumbai – 400 076	Member
9	DSIR-Scientist-G & above	Shri Ashwani Gupta Scientist 'G' Department of Scientific and Industrial Research New Delhi – 110 016	Member

Sl. No.	SCRD - Main Committee	Name	Position
10	DIPP-IPR Expert	Ms. Palka Sahni Deputy Secretary Dept. of Industrial Policy & Promotion (DIPP) Ministry of Commerce &Industry, Udyog Bhavan New Delhi – 110 011	Member
11	Director General - CPRI	Shri V S Nandakumar Director General, CPRI	Convener
	Special Invitee		
12	Chief Engineer (R&D) CEA, New Delhi.	Smt. Seema Saxena Chief Engineer (R&D) Central Electricity Authority, 3rd Floor, Sewa Bhavan R K Puram, Sector -1, New Delhi – 110 066	Member
13	BHEL	Director (E,R&D), BHEL, New Delhi	Member
14	POWERGRID	Director (Projects) Power Grid Corporation of India Ltd. 'Saudamini', Plot No. 2, Sector 29, Gurgaon, Haryana – 122 001	Member
15	NTPC	Shri R K Srivastava Executive Director (NETRA) E3 ECOTECH-II, Udhyog Vihar, Gautam Budh Nagar – 201 306 (Uttar Pradesh)	Member
16	NHPC	Shri J. Choudhary GM (O&M) Division, NHPC Ltd., NHPC Office Complex Sector-33, Faridabad – 121 003	Member
17	MNRE	Ms. Varsha Joshi Joint Secretary Ministry of New and Renewable Energy Block 14, CGO Complex, Lodhi Road, New Delhi - 110 003	Member

Appendix – 4

The Members of Technical Committee on Thermal Research as on 31st March 2018

Sl. No.	Affiliation	Position	Name
1	Professor from IIT-B, Mumbai	Chairman	Prof. R P Vedula, Dept of Mechanical Engg. IIT-B, Powai, Mumbai - 400 076
2	ED, NETRA, NTPC	Member	Shri Harjeet Singh AGM (NETRA) E3 ECOTECH-II, Udhyog Vihar, Gautam Budh Nagar – 201 306 (Uttar Pradesh)
3	ED- BHEL (Thermal)	Member	Shri Shailendra Bhatnagar GM/PEM, BHEL House, Siri Fort, New Delhi -110 049
4	Chief Engineer (TE&TD), CEA	Member	Chief Engineer (TE & TD) Central Electricity Authority Sewa Bhawan; 9th Floor; South Wing, R K Puram; Sector-1, New Delhi -110 066
5	Representative of Generating Company (TATA Power Ltd)	Member	Shri N Gopalakrishnan Unni, Head – Operations Management The Tata Power Co. Ltd. Shatabdi Bhawan, B 12 & 13, Sector 4 Noida – 201 301, Uttar Pradesh.
6	CPRI representative	Member	Dr Saravanan V Joint Director, MTD, CPRI, Bangalore
		Member	Dr. S K Nath, Joint Director, TRC, CPRI, Nagpur
7	Chief Engineer-R&D / Director-R&D, CEA	Permanent invitee	Chief Engineer (R&D), CEA, New Delhi
8	CPRI	Member - Convener	Head R&D Management Division, CPRI, Bangalore

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The Members of Technical Committee on Hydro Research as on 31st March 2018

Sl. No.	Affiliation	Position	Name
1	Professor from IIT - Roorkee	Chairman	Prof. B. K. Gandhi Dept. of Mechanical & Industrial Engineering, IIT Roorkee, Roorkee – 247 667
2	ED - BHEL (Hydro Expert)	Member	Shri Dinesh Kumar, GM/HE, BHEL, Bhopal
3	ED - NHPC (Hydro Expert)	Member	Shri J. Choudhary GM (O&M) Division, NHPC Ltd., NHPC Office Complex, Sector-33, Faridabad – 121 003
4	ED - SJVNL (Hydro Expert)	Member	S. P. Pathak General Manager Electrical Design Department Mehta Niwas, New Shimla – 171 009
5	Chief Engineer, CWC, New Delhi	Member	Dr. R. K. Gupta Chief Engineer, Design (E&NE) Central Water Commission Sewa Bhawan, R. K. Puram New Delhi – 110 066
6	Chief Engineer (HE&TD), CEA	Member	Chief Engineer (HE&TD) Central Electricity Authority Sewa Bhawan, 7th Floor; North Wing, R K Puram, Sector-1 New Delhi - 110 066
7	Representative from CPRI	Member	Shri Janardhana M Joint Director, MTD, CPRI, Bangalore
		Member	Dr. R K Kumar Joint Director, MTD, CPRI, Bangalore
8	Chief Engineer-R&D / Director-R&D, CEA	Permanent Invitee	Chief Engineer (R&D), CEA, New Delhi
9	CPRI	Member - Convener	Head R&D Management Division, CPRI, Bangalore

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The Members of Technical Committee on Transmission Research as on 31st March 2018

Sl No.	Affiliation	Position	Name
1	Professor from IIT - Kanpur	Chairman	Prof. S. C. Srivastava Department of Electrical Engineering Indian Institute of Technology, Kanpur – 208 016
2	ED - BHEL (Transmission)	Member	Executive Director (TBG) Bharat Heavy Electricals Limited TBG Tower A, 5th Floor, Advant Navis, IT Business Park, Plot No-7, Sector-142, Expressway Noida, Noida – 201 305
3	ED - POWERGRID	Member	Shri M Krishna Kumar Executive Director (Technology Development) Power Grid Corporation of India Limited "Saudamini", Plot No. 2, Sector-29, Gurgaon – 122 001, Haryana
4	Chief Engineer (SETD), CEA	Member	Chief Engineer (PSETD) Central Electricity Authority, Sewa Bhavan, 3rd Floor, R K Puram, Sector -1, New Delhi – 110 066
5	Representative of state Transco (KPTCL)	Member	Shri S. Sumanth Director (Transmission) Karnataka Power Transmission Corpn. Ltd. Kaveri Bhavan, K. G. Road , Bangalore – 560 009
6	Representative of IEEMA	Member	Shri Bapu J Amritkar President – Business Head Transformers EMco Limited Plot No. F-5, Road No. 28, Wagle Industrial Estate, Thane – 400 604
7	Representative of CPRI	Member	Dr. N. Vasudev Additional Director, HVD, CPRI, Bangalore
		Member	Smt. K. S. Meera Additional Director, PSD, CPRI, Bangalore
		Member	Dr. P. M. Nirgude Joint Director, UHVRL, CPRI, Hyderabad
8	Chief Engineer - R&D/ Director-R&D, CEA	Permanent Invitee	Chief Engineer (R&D), CEA, New Delhi
9	CPRI	Member - Convener	Head R&D Management Division, CPRI, Bangalore

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The Members of Technical Committee on Grid, Distribution & Energy Conservation Research as on 31st March 2018

Sl. No.	Affiliation	Position	Name
1	Prof. S. V. Kulkarni, Professor IIT - Mumbai	Chairman	Prof. S. V. Kulkarni, FNAE Professor Department of Electrical Engineering IIT- Bombay, Powai, Mumbai – 400 076
2	Representative from BEE	Member	Shri Saurabh Diddi Energy Economist Bureau of Energy Efficiency 4th Floor, Sewa Bhavan, RK Puram, New Delhi -110 066
3	Chief Engineer (DP&D), CEA	Member	Chief Engineer (DP&D) Central Electricity Authority, Sector -1, 7th Floor, Sewa Bhavan, R K Puram, New Delhi – 110 066
4	Representative from MNRE	Member	Dr. P. C. Maithani Director Ministry of New and Renewable Energy Block 14, CGO Complex, Lodhi Road, New Delhi - 110 003
5	Representatives of TANGEDCO	Member	Chief Engineer (IC, R&D) TANGEDCO, 4th Floor, Eastern Wing, 144, Anna Salai, Chennai – 600 002
6	Representative of IEEMA	Member	Shri Srinivas Gopa General Manager – R&D – HV GIS Siemens Ltd E-76, Waluj MIDC Area, Aurangabad – 431 136
7	Representative of CPRI	Member	Shri Sudhir Kumar R Joint Director, ERED, CPRI, Bangalore
		Member	Shri Jyotibasu S Joint Director, ERED, CPRI, Bangalore
		Member	Dr. Amit Jain Joint Director, PSD, CPRI, Bangalore
8	Chief Engineer-R&D / Director-R&D, CEA	Permanent invitee	Chief Engineer (R&D) CEA, New Delhi
9	CPRI	Member Convener	Head R&D Management Division, CPRI, Bangalore

Appendix – 8

Personnel deputed abroad for Meeting / Conference / Pre-dispatch Inspection of equipment during the year 2017-18

Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
1	V S Nandakumar Director General-CPRI K Ravikumar Additional Director CPRI, Bangalore V Shivakumar Engg. Officer Gr.4 CPRI, Bangalore M Pradish Engg. Officer Gr 3 CPRI, Bangalore Ramesh Patil Engg. Officer Gr 2 CPRI, Bangalore	Technical visit to various US National Laboratories as part of USTDA funded consultancy towards Technical Assistance Consultancy program for CPRI Smart Grid Test Bed by M/s. ESTA International LLC, USA	Virginia, USA	10th to 21st April, 2017
2	Dr. M Venkateswara Rao Joint Director CPRI, Bangalore	Attending Pre-Dispatch Inspection and Training of "X-Ray based Stress Analysis System at the works of M/s. Rigaku Corporation, Japan	Tokyo, Japan	17th to 21st April, 2017
3	Arvind Kumar Engg. Officer Gr. 3 CPRI, Bangalore	For attending Pre-dispatch inspection and Training of "Portable Ultrasonic System" for boiler tubes inspection at the works of M/s. Innerspec Technologies Inc., USA	Virginia, USA	17th to 21st April, 2017
4	M K Wadhwani Additional Director STDS-CPRI, Bhopal	For attending 43rd STL M.C. meeting in KERI at Korea	Changwon, Korea	26th to 29th April, 2017
5	N R Mondal Additional Director STDS-CPRI, Bhopal Shyam R Engg. Officer Gr 2 CPRI, Bangalore	For CPRI participation in African Utility Week exhibition at Cape Town, South Africa	Cape Town South Africa	15th to 18th May, 2017
6	M Janardhana Joint Director CPRI, Bangalore	For attending the Pre-Dispatch Inspection and training "Rebotics System for Boiler Tube at the works of M/s. Russel NDE System, Canada	Edmonton, Canada	10th to 14th July, 2017

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Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
7	Deepa Warudhkar Engg. Officer Gr 4 STDS-CPRI, Bhopal	For attending Pre Dispatch Inspection and training of "Three Phase portable power source with reference meter of 0.02% accuracy" at the works of ZERA GmbH, Germany	Konigswinter, Germany	17th to 21st July, 2017
8	B A Sawale Additional Director STDS-CPRI, Bhopal	For attending Pre Dispatch Inspection and training of Atlas Solar Radiation Test Chamber at the works of M/s Weiss, Umwelttechnik GmbH, Germany	Reiskricheu, Germany	21st to 25th August, 2017
9	Dr. B Nageshwara Rao Additional Director CPRI, Bangalore	For participating and presentation of Technical paper in 20th ISH 2017 High Voltage Engg.	Buenos Aires, Argentina	28th August, 2017 to 1st September, 2017
10	B A Sawale Additional Director STDS-CPRI, Bhopal	For attending the IEC TC13/WG11 meeting at Hungary	Godollo, Hungary	11th to 13th September, 2017
11	Dr. K T Varughese Additional Director CPRI, Bangalore N Maheshwar Rao Engg. Officer Gr. 3 CPRI, Bangalore	CPRI participation in the India – Bangladesh Engineering Exhibition, INDEE- Bangladesh 2017 Exhibition at Dhaka	Dhaka, Bangladesh	1st to 4th November, 2017
12	S Sudhakara Reddy Additional Director CPRI, Bangalore	For participating in the 65th STL (Short Circuit Testing Liaison) Technical Committee meeting held in Philadelphia, USA	Philadelphia, USA	14th & 15th November, 2017
13	R Sudhir Kumar Joint Director CPRI, Bangalore S Jothibasu Joint Director CPRI, Bangalore N Rajkumar Joint Director CPRI, Bangalore Dr. V Saravanan Joint Director CPRI, Bangalore	To provide Training on plant optimization to Hwange Power Station, Zimbabwe Power Company Engineers	Victoria Falls, Zimbabwe	4th February, 2018 to 3rd March, 2018

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Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
14	Dr. K T Varughese Additional Director CPRI, Bangalore G R Viswanath Joint Director RTL-CPRI, Noida	For CPRI participation in India Sourcing Fair Exhibition held at St. Peterburg, Russia	St. Peterburg, Russia	20th to 22nd March, 2018

Appendix – 9

Membership of CPRI Officers in International / National Committees

Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
1	Dr. B. Nageshwar Rao Additional Director CPRI, Bangalore	Chairman	BIS ET -09 Power Cables Committee
		Member	IEC Project team 62985 for DC High voltage cables
			CIGRE India Study Committee for Power Cables
			IEC Technical Committee 20, Working Group 16
2	Dr. N. Vasudev Additional Director CPRI, Bangalore	Chairman	BIS Technical Committee High Voltage Engineering ETD -19
		Principal Member	BIS Technical Committee for Electrical Insulators & Accessories Sectional Committee -ETD 06
			Basic Electro Technical Standards Sectional Committee ETD -01
		Member	CIGRE National Committee for Overhead Lines,
3	S Ganga Additional Director CPRI, Bangalore	Member	Solid Electrical Insulating Materials & Insulating Systems Sectional Committee -ET-02
		Representative from CPRI	Working Group comprising of NTPC (convener) and other members from NHPC, PGCIL, CEA and ERDA to prepare draft revision of IS 15652 in line with the latest developments at international level
4	Anupam Awasthi Additional Director CPRI, Bangalore	Chairman	BIS Sectional Committee on Low Voltage Switchgear and Controlgear, ET-07
5	Meera K. S Additional Director CPRI, Bangalore	Principal Member	HVDC Power Systems Sectional Committee, ETD 40
			Power System Control and Communications Sectional Committee, LITD 10, its Panels
			LVDC Distribution Systems and Micro Grid Sectional Committee, ETD 50
6	J. Santhosh Additional Director & Unit Head STDS-CPRI, Bhopal	Chairman	BIS, ETD-01 "Basic Electro Technical Standards and Power Quality Sectional Committee"

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Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
7	M. K. Wadhwani, Additional Director STDS-CPRI, Bhopal	Chairman	High Voltage Switchgear & Control Gear Sectional Committee ETD-08 of BIS
		Principal Member	Electrotechnical Division Council (ETDC) of BIS
		Member	BIS Power Transformers Sectional Committee ETD-16
			Fuses Sectional Committee BT- 39
8	B.M.Mehra Additional Director STDS-CPRI, Bhopal	Expert Member	IEC-International Electrotechnical Commission Committee No. IEC TC 38 for Instrument Transformer and representing Bureau of Indian Standards, New Delhi in their two Subcommittees: - IEC TC 38/MT40: Maintenance Team of IEC 60044-6, Current Transformer for transient performance. - IEC TC38/WG AHG41:Working Group for Power Quality Measurement
		Principal Member	Standing Committee to investigate the failure of equipments at 220kV and above sub-stations
		Member	BIS Sectional Committee- Electrical Insulators and Accessories, ET-06
9	B.A. Sawale Additional Director STDS-CPRI, Bhopal	Member & Convener of Panel	BIS ET-13
		Member	Expert Committee of Energy Metering- CBIP
			IEC TC13/WG11, WG14, WG15
			State Tariff Advisory Committee for MPSERC
10	Swaraj Kumar Das Additional Director CPRI, Bangalore	Member	BIS Sectional Committee, ET -34 & ET- 07
			Technical Committee of BEE Distribution Transformer Standards & labeling program
11	Dr. Pradeep M Nirgude Additional Director UHVRL-CPRI, Hyderabad	Principal Member	BIS ET-48 -UHV AC Transmission Systems - Sectional Committee
			BIS-ET-19- High Voltage Engineering Sectional Committee
			BIS ET- 36 – Tools & Equipment for live working -Sectional Committee
		Alternate Member	Indian National Committee (IEC)
			Standing Committee on Research and Development (SCRD)
			Bureau of Indian Standards (BIS) ET-30 - Surge Arresters Sectional Committee
			Basic Electro Technical Standards and Power Quality Sectional Committee ETD – 01

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Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
12	S. Bhattacharya Additional Director CPRI- RTL, Noida	Alternate Member	BIS Committee on Instrument Transformers ET-34
			BIS Committee Low Voltage Switchgear & Controlgear ET-07
13	S. Sudhakara Reddy Additional Director CPRI, Bangalore	Principal Member	Work of Electrical Traction Equipment Section Committee, ETD-47 of BIS
		Member	BIS Committee on Transformers ETD-16
			BIS Committee on High Voltage Switchgear and Controlgear Sectional Committee, ETD-08
			Task Group of STL on Transformers
14	D Ravindra Additional Director CPRI, Bangalore	Member	ETD-03 BIS Technical Committee
15	Shivakumar V, Joint Director CPRI, Bangalore	Member	IEC TC-57/WG15 (Security)
			BIS-LITD-10, Panel -2 (Security)
			Indian National Committee of International Electro Technical Commission (INC-IEC)
		Alternate Member	Environmental testing procedures Sectional Committee LITD- 01 of BIS
16	K.P. Meena Joint Director CPRI, Bangalore	Principal Member	BIS ET -09 Power Cables Committee
17	R. Sudhir Kumar Joint Director CPRI, Bangalore	Principal Member	BIS-Sectional Committee ETD-23 "Electric Lamps and their Auxiliaries"
			BIS-Sectional Committee ETD-28 "Solar Photovoltaic Energy Systems"
		Member	Electrical Energy Storage System Sectional Committee, ETD-52 for Standardization in the field of grid integrated Electrical Energy Storage Systems
		Certified "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
18	S. Jothibasu Joint Director CPRI, Bangalore	Principal Member	BIS, Solar Pumps Committee
		Accredited "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India

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Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
19	D. Revanna Joint Director CPRI, Bangalore	Principal Member	Panel of experts on manual on Transmission lines, CBI & P, New Delhi
		Alternate Member	"Use of steel in over lead line towers and switch yard structure and masts for telecommunication and flood lighting" -Sub Committee – CED 7:1 of BIS, New Delhi
		Member	Standing committee of experts to investigate Cause of failure of towers, Central Electricity Authority (CEA), New Delhi
			Conductors and accessories on Overhead Lines -BIS Committee ET 37, IEC/TC7 & TC11
			Committee for audit of transmission lines tower with respect to design & life of towers, CEA/CEID, New Delhi
20	M.D.Anantha Babu Joint Director CPRI, Bangalore	Principal Member	Conductors and accessories on Overhead Lines -BIS Committee ET 37, IEC/TC7 & TC11
21	Dr. M. Selvaraj Joint Director CPRI, Bangalore	Main Member	- Use of steel in over lead line towers and switch yard structure and masts for telecommunication and flood lighting" -Subcommittee- – CED 7:1 of BIS, New Delhi
		Alternate Member	Panel of experts on manual on Transmission lines - CBI & P, New Delhi
		Individual Member	SCB2 Overhead lines, CIGRE, Paris
22	M. Janardhana Joint Director CPRI, Bangalore	Alternate Member	ETD-44- Safety of Machinery
23	Dr. M.Venakteswara Rao Joint Director CPRI, Bangalore	Member	Standardization of environmental aspects ETD 23
24	Dr. V. Saravanan Joint Director CPRI, Bangalore	Alternate Member	Clay and Stabilised soil products for construction, CED -30
25	S. Vynatheya Joint Director CPRI, Bangalore	Alternate Member	MTD-4, BIS Flat Steel Products Subcommittee, MTD 4:3
26	Dr. Amit Jain Joint Director CPRI, Bangalore	Principal Member	BIS-LITD10 (Power System Control and Associated Communications Sectional Committee)
		Member	Project Review Committee (PRC-1) for NaMPET Phase-II
			BIS-ET 46 (Grid Integration of Renewables)

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Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
27	J. Sreedevi Joint Director CPRI, Bangalore	Principal Member	BIS - Wind Turbines Sectional Committee ETD -42
			CIGRE Study Committee B4.72, DC Grid Benchmark Models for System Studies
		Alternate Member	HVDC Power Systems Sectional Committee, ETD -40
28	P Kaliappan Joint Director CPRI, Bangalore	Principal Member	BIS ETD 35 Power Systems Relaying Committee
		Secretary	Panel 4 of LITD 10 PMU panel for PMU Testing and Certification
29	G.R. Viswanath Joint Director RTL-CPRI, Noida	Alternate Member	BIS Technical Committee ET- 03 on Electro Technical Fluids
			BIS Technical Committee ET- 43
30	Manoher Singh Takkher Joint Director STDS-CPRI, Bhopal	Member	Highvoltage Switchgear & Control gear Sectional Committee ETD-08 of BIS
31	Sumbul Munshi Joint Director STDS-CPRI, Bhopal	Member	BIS Committee on Low Voltage Switchgear & Controlgear ET- 07
32	N. Rajkumar Joint Director CPRI, Bangalore	Principal Member	BIS Safety of Machinery Sectional Committee (ETD- 44)
		Expert Member	Excellence Enhancement Centre for Indian Power Sector (An Indo German Energy Co-operation), CEA, New Delhi
		Alternate Member	BIS Lamps and related equipment Sectional Committee (ETD- 23)
			BIS Solar Photo-voltaic energy Sectional Committee (ETD -28)
			BIS Solar Pumps Sectional Committee
		Accredited "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
		Member	Prototype Committee of National Institute of Wind Energy (NIWE), Chennai
33	Yugal Agrawal, Joint Director STDS-CPRI, Bhopal	Member	BIS Sectional Committee ETD 47, Electrical Traction Equipments
34	G. Kishore Kumar Engg. Officer Gr.4 CPRI, Bangalore	Member	Clay and Stabilized soil products for construction, CED -30 of BIS
			MTD-4, BIS -Flat Steel Products Subcommittee, MTD 4.3

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Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
35	G. Girija Engg. Officer Gr. 4 CPRI, Bangalore	Member	BIS Sectional Committee for Environmental Conditions Testing Procedures for Electronic Products - LITD - 01
36	K.A. Aravind Engg. Officer Gr.4 UHVRL-CPRI, Hyderabad	Alternate Member	BIS ETD-19 - High Voltage Engineering
37	Dr. Kuldeep Singh Rana Scientific Officer Gr.3 CPRI, Bangalore	Principal Member	BIS ETD- 10 & 11, for Primary, Secondary Cell and Batteries
		Member	Electrotechnology in Mobility Sectional Committee, BIS ETD-51
38	Dharmesh Yelamanchi Engg. Officer Gr.3 CPRI, Bangalore	Alternate Member	Sectional Committee, ET -06, BIS
			Sectional Committee, ET -19, BIS
39	Dr. Manohar Singh, Engg. Officer Gr.3 CPRI, Bangalore	Alternate Member	BIS - Wind Turbines Sectional Committee ETD -42
			ETD 35 Power Systems Relaying Committee
40	Thirumurthy Engg. Officer Gr.3 CPRI, Bangalore	Alternate Member	BIS ET -09 Power Cables Committee
41	V. Vaidhyanathan Engg. Officer Gr.3 CPRI, Bangalore	Principal Member	Power Capacitors Sectional Committee ET -29 of BIS
42	Pradish M Engg. Officer Gr.3 CPRI, Bangalore	Member	BIS ETD13
			BIS ETD-13, Panel 1 & Panel 4
			BIS LITD-10, Panel 1 & panel 3
43	Shaileshwari M U, Engg. Officer Gr.3 CPRI, Bangalore	Member	BIS LITD-10, Panel- 2 on security
44	Jithin Pauly P Engg. Officer Gr.2 CPRI, Bangalore	Alternate Member	Sectional Committee BIS ETD-30
			Sectional Committee, ETD-48, BIS
45	D. Venkatesh Engg. Officer Gr.2 CPRI, Bangalore	Principal Member	BIS ETD-32 Committee for Electrical Appliances

Appendix – 10

Papers presented / published indicating Event / Venue / Journal for 2017-18

Cables & Diagnostics Division

1) Arunjothi R, Meena K. P., B. Nageshwar Rao & Burjupati, titled "Selection of Entropy based mother-wavelet and level dependent threshold techniques for de-noising of Partial Discharge Signals", at 20th International Symposium on High Voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.
2) Jayakrishnan. M., & B. Nageshwar Rao, titled "Energy based wavelet selection for de-noising PD signals using modified wavelet packet transform", at 20th International Symposium on High Voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.
3) Manas Ranjan Patra & B. Nageshwar Rao, titled "A Study on the effect of Moisture on Paper Insulation Impregnated with Mineral oil and Ester oil using Frequency Domain Dielectric Spectroscopy", at 20th International Symposium on High Voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.
4) Muhammed Faisal, Rahman, B. Nageshwar Rao, Pradeep M. Nirgude & Thirumurthy titled "Influence of Moisture on Partial Discharge Characteristics of oil impregnated pressboard under Non-uniform field", at 20th International Symposium on High Voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.
5) Ramesh. P. Nair, B. Nageshwar Rao & B. V. Sumangala, titled "Statistical Analysis of Surface discharges in Rotating Machine Stator Insulation system", at 20th International Symposium on High Voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.
6) S. Thadela, Abhay Singh Gour, Burjupati, B. Nageshwar Rao & V. V. Rao titled "Demonstration of a Cold Dielectric based High Temperature Superconducting (HTS) power cable", at 9th Asian Conference on Applied Superconductivity and Cryogenics (ACASC) 2017, held at Jeju Island, South Korea, from 5th to 8th November, 2017.
7) R. Arunjothi, K. P. Meena & B. Nageshwar Rao titled "Simulation of Partial Discharges and Implementation of Noise Elimination Techniques", at 3rd International Conference On Condition Assessment Technique in Electrical Systems "CATCON 2017", held at IIT, Ropar, from 16th to 18th November, 2017.
8) Ramesh P. Nair, B. Nageshwar Rao & B. V. Sumangala titled "Study of Corona with and without Barrier at 0.1 Hz and 50 Hz frequency Sinusoidal Voltage Excitation", at 3rd International Conference On Condition Assessment Technique in Electrical Systems "CATCON 2017", held at IIT, Ropar, from16th to 18th November, 2017.
9) Jayakrishnan. M. & B. Nageshwar Rao titled "Application of Modified Wavelet Packet transform for De-Noising during Partial Discharge Measurement on Power Cables", at 3rd International Conference On Condition Assessment Technique in Electrical Systems "CATCON 2017", held at IIT, Ropar, from 16th to 18th November, 2017.

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10) T. Sudheer, Maalika Sarkar, Abhay S Gour, V. V. Rao & B. Nageshwar Rao, titled "Development and Testing of a High Temperature Superconducting (HTS) Cable for Smart Grid Applications", at 3rd International Conference On Condition Assessment Technique in Electrical Systems "CATCON 2017", held at IIT, Ropar, from 16th to 18th November, 2017.

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153) N. Maheshwara Rao, B.R.Vasudevamurthy & Swaraj Kumar Das, titled "Controlled switching in HV networks- Implementations and Review of present status", in the Two day National Conference on "Latest Trends in Switchgear & Controlgear -Smart Technologies", "SWITCHCON-2018", held at Hotel Noor-Us-Sabah, Bhopal, on 23rd & 24th February, 2018.

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Switchgear Testing & Development Station- Bhopal

155) Yugal Agrawal, J. Santhosh, M. K. Wadhwani, Manoher Singh, Kamlesh R & Deepti Ranjan , titled "Short circuit withstand test on multi winding transformer for solar application: case study of failure analysis", in Seminar on 'Technology trends in design, Testing, Operation and maintenance of power and distribution transformers", organized by HPL-CPRI, Bangalore at CPRI, Bangalore, on 26th & 27th October, 2017.

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164) Priyamvda Chandel & B.A. Sawale, titled "Energy Meter Tampering: Major Cause of Non - Technical Losses in Indian Distribution Sector", Paper published in IEEE Xplore Digital Library, 4th May, 2017

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Training Division

166) M. G. Ananda Kumar, titled "Thermal Shock Resistance Behaviour of Microwave Sintered PM based Aluminium Cenospheres Syntactic Foams", at International Conference on Composite Materials and Structures, organized by IIT, held at Hyderabad, from 27th to 29th December, 2017.

Ultra High Voltage Research Laboratory, Hyderabad

167) B. Sravanthi, K. A. Aravind, B. Yashodara, Pradeep M Nirgude, K. Sandhya, V. Kamaraju & A.V.R.S. Sharma, titled "Assessment of field aged composite insulators" at "20th International Symposium on High voltage Engineering, held at Buenos Aires, Argentina, from 27th August to 1st September, 2017.

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170) P. Raja Mani, G. Venkateswar Rao, K. Govardhanacharry & Pradeep M Nirgude, titled "Studies of factors influencing the RIV measurement of UHV switchgear" at National Conference on "Latest trends in switchgear and control gear – smart technologies", held at Bhopal, on 23rd & 24th February, 2018.

171) Pradeep M Nirgude, titled "Diagnosing Transformer winding movement and deformation by frequency response analysis" at National Conference on "Technology trends in Design, Testing, Operation and Maintenance of Power and Distribution Transformers", held at CPRI, Bangalore, on 26th & 27th October, 2017.

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Appendix – 11

RAO & EMMAR
CHARTERED ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT

To,
The Governing Council
Central Power Research Institute
Bangalore.

Report on the Financial Statements

We have audited the accompanying financial statements of **CENTRAL POWER RESEARCH INSTITUTE** ("the Institute"), which comprise the Balance Sheet as at March 31, 2018, the Income and Expenditure Account for the year then ended, and the Statement of Receipts and Payments of the Institute for the year thereto and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

The Management of the Institute is responsible for the preparation of the financial statements in accordance with the generally accepted accounting principles in India. This responsibility includes the design, implementation and maintenance of internal controls relevant to the preparation and presentation of the financial statements that give a true and fair view and are free from material misstatements, whether due to fraud or error.

Auditor's Responsibility.

Our responsibility is to express an opinion on these financial statements based on our audit. We have conducted our audit in accordance with the standards on auditing issued by the Institute of Chartered Accountants of India.

Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

Offices : Bangalore, New Delhi, Durg, Kolhapur, Mumbai, Pune ,Shimoga, Indore, Goa, Guwahati, Raipur, Surat

#P-6c Champaka Building,3rd Floor, 1st Main,1st Stage, Peenya Industrial Area
Bengaluru - 560058. Ph. No. 080-6888 8815 | e-mail : info@raoemmar.com | Website : www.raoemmar.com

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An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgment, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal controls relevant to the Institute's preparation and fair presentation of the financial statements that give a true and fair view in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Institute's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the reasonableness of the accounting estimates made by the management, as well as evaluating the overall presentation of the financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our qualified audit opinion on the financial statements.

Opinion

In our opinion and to the best of our information and according to the explanations given to us, subject to the possible effects of the matters herein described in the Emphasis of Matter paragraph, the aforesaid financial statements give the information in a true and fair manner in conformity with the accounting principles generally accepted in India

a) In the case of the Balance Sheet, of the state of affairs of the Institute as at March 31, 2018; and
b) In the case of the Income and Expenditure Account, of the excess of income over expenditure for the year ended as on that date; and
c) In the case of the Receipts and Payments Statement, of the cash flows for the year ended as on that date.

Emphasis of Matter Paragraph

a. Advance received from Debtors of INR 55,50,38,472/- consists of unreconciled amounts which will have an impact on revenue recognized by the Institute. There are also amounts which will need to be reconciled with the receivables that will result in reduction of both advances received and receivables. The effect of the same, if any, on the surplus during the year and debtors and/or deposits could not be ascertained. The age wise break up and a review system of long standing advances are not available as part of internal control system of the Institute.

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b. Outstanding Receivables amounting to INR 38,63,36,981/- is subject to confirmation.

c. Note 4 of Schedule 16 where Inventories are to be valued at Cost which includes expenses incurred for procuring the inventory which are directly Attributable to the end-product. However all the Consumable Stores, Spares are being directly charged off to the Statement of Income and Expenditure and no Effect is being given to the Inventory. The Institute lacks an Inventory Management System for tracking Consumables.

d. The capitalization of Assets with respect to Civil Works are based on the Approval of the Additional Director of the Institute. Work Completion Certificates certified by external expert is not furnished to us for verification and quantification of the same.

e. Physical verification of Fixed Assets was not conducted during the year and Fixed Assets registers were not updated on a regular basis as and when the said assets are procured.

For Rao and Emmar
Chartered Accountants.
Firm Reg. No.: 003084S.

Adarsh N A
Partner
Membership No.: 240166

Date: September 17, 2018
Place: Bengaluru.

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CENTRAL POWER RESEARCH INSTITUE, BANGALORE.

BALANCE SHEET AS AT 31ST MARCH 2018

(Amount in ₹)

Capital Fund and Liabilities	**Schedule**	**Current Year**	**Previous Year**
Capital Reserve representing Assets acquired from Grant-in-Aid from Government of India and Others	1	959,06,41,223	866,99,93,534
Reserves and Surplus	2	48,77,32,989	45,44,33,645
Earmarked and Endowment Funds	3	646,20,79,260	575,36,57,672
Grants from Government of India	4	43,54,57,008	82,19,74,566
Current Liabilities and Provisions	5	90,08,72,017	79,42,12,029
TOTAL		**1787,67,82,497**	**1649,42,71,446**
Assets			
Fixed Assets	6	928,66,41,223	831,08,60,925
Less: Depreciation provided		224,97,41,484	205,19,73,790
		703,68,99,739	625,88,87,135
Investments from Earmarked & Endowment Funds	7	578,11,49,424	512,95,24,701
Current Assets, Loans and Advances	8	505,87,33,334	510,58,59,610
TOTAL		**1787,67,82,497**	**1649,42,71,446**
Notes on Accounts & Contingent Liability	16		
Significant Accounting Policies	17		

Schedules 1 to 8 and 16 & 17 form part of Balance Sheet

As per Our Report of Even Date
for RAO & EMMAR.,
Chartered Accountants
FRN-003084S

Bangalore
17-09- 2018

(C.S. Murali Krishna)
Chief Accounts Officer

(V.S Nandakumar)
Director General

(Adarsh N A)
Partner
Membership No. 240166

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2018

(Amount in ₹)

INCOME	Schedule	Current Year	Previous Year
Income from Test Fee & Consultancy	9	165,99,38,977	161,47,83,055
Fees	10	2,11,13,237	2,12,79,589
Interest Earned	11	22,21,57,868	19,49,41,608
Other Income	12	72,50,977	74,90,326
TOTAL (A)		**191,04,61,059**	**183,84,94,578**
EXPENDITURE			
Research Establishment Expenses	13	113,76,12,140	110,40,71,610
Research Administrative Expenses	14	35,30,39,543	40,52,57,762
Depreciation	15	19,77,67,693	19,13,95,931
TOTAL (B)		**168,84,19,376**	**170,07,25,303**
Balance being excess of Income over Expenditure (A-B)		22,20,41,683	13,77,69,275
Add:			
Opening Balance of General Reserve Account		1,43,62,947	1,33,28,482
Excess Assets Capiltalised out of ICICI loan (Point 3)		5,05,192	-
Less:			
Transfer to 'Reserve for Capital Expenditure' during financial year 2017-18		15,00,00,000	3,50,00,000
Assets directly acquired out of General Reserve		98,17,244	5,47,745
Investment in NHPTL Equity Capital		-	6,40,00,000
Assets (Non Plan) acquired transferred to Capital Reserve		6,69,90,764	3,71,87,065
CLOSING BALANCE OF GENERAL RESERVE		**1,01,01,814**	**1,43,62,947**
Notes on Accounts & Contingent Liability	16		
Significant Accounting Policies	17		

Schedules 9 to 15 and 16 & 17 form part of Income & Expenditure Account

As per Our Report of Even Date
for RAO & EMMAR.,
Chartered Accountants
FRN-003084S

Rao & Emmar Chartered Accountants BANGALORE

Bangalore
17-09-2018

(C.S. Murali Krishna)
Chief Accounts Officer

(V.S Nandakumar)
Director General

(Adarsh N A)
Partner
Membership No. 240166

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

	SCHEDULE - 1	Current Year		Previous Year	
	CAPITAL RESERVE REPRESENTING ASSETS ACQUIRED FROM GRANT-IN-AID FROM GOVT. OF INDIA AND INTERNAL RESOURCES				
a)	Under Plan Capital (Grant)	761,58,72,037		686,51,79,371	
	Addition during the year	74,92,69,982		75,06,92,666	
	Less: Sale of Fixed Assets *	4,92,14,634			
	Less: Sale of Fixed Assets *	54,12,783			
			831,05,14,602		761,58,72,037
b)	Under Plan Capital (Grant) (For M/s. NHPTL Equity Capital)	24,00,00,000		23,90,00,000	
	Addition during the year	-	24,00,00,000	10,00,000	24,00,00,000
c)	Under R&D Plan	29,18,09,760		28,18,06,845	
	Addition during the year	92,88,106	30,10,97,866	1,00,02,915	29,18,09,760
d)	Assets Acquired out of RSoP & NPP Management Fund	24,04,110		24,04,110	
	Addition during the year	-	24,04,110	-	24,04,110
	Sub Total (A)		885,40,16,578		815,00,85,907
	ASSETS ACQUIRED FROM INTERNAL RESOURCES				
e)	Under Plan Capital (CPRI's 10% Contribn.)	71,03,651		71,03,651	
	Addition during the year	10,26,51,389		-	
			10,97,55,040		71,03,651
f)	Under Non-Plan	14,61,47,857		10,89,60,792	
	Addition during the year	6,69,90,764		3,71,87,065	
	Less: Assets disposed-off	-	21,31,38,621	-	14,61,47,857
g)	Under Non-Plan (Equity Participation)	6,40,00,000		-	
	Addition during the year	-	6,40,00,000	6,40,00,000	6,40,00,000
h)	Assets Acquired out of General Reserve	6,35,48,011		6,30,00,266	
	Addition during the year	98,17,244	7,33,65,255	5,47,745	6,35,48,011
i)	Assets Acquired out of Sponsored Schemes	18,41,95,325		17,50,04,383	
	Addition during the year	3,77,62,813	22,19,58,138	91,90,942	18,41,95,325
j)	Capitalisation of Assets acquired out of Loan	4,95,00,000		4,95,00,000	
	Less: Excess Assets Capitalisation *	5,05,192	4,89,94,808	-	4,95,00,000
k)	Surplus on sale of Asset	54,12,783		54,12,783	
	Addition during the year	-	54,12,783	-	54,12,783
	Sub Total (B)		73,66,24,645		51,99,07,627
	TOTAL (A+B)		**9,59,06,41,223**		**8,66,99,93,534**

*** Ref. Schedule 16 Point No.2 Fixed Assets**

Place : Bangalore,
Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

	SCHEDULE 2	Current Year		Previous Year	
	RESERVES AND SURPLUS				
A	**GENERAL RESERVE**				
	As per last Account	1,43,62,947		1,33,28,482	
	Add: Surplus during the year	22,20,41,683		13,77,69,275	
	Add: ICICI Excess Loan taken *	5,05,192			
	Less: Transfer to 'Reserve for Capital Expenditure' during financial year 2017-18	15,00,00,000		3,50,00,000	
	Less: Assets directly acquired out of General Reserve	98,17,244		5,47,745	
	Less: Investment in NHPTL Equity Capital	-		6,40,00,000	
	Less: Assets (Non Plan) acquired transferred to Capital Reserve	6,69,90,764		3,71,87,065	
	Net Balance A		**1,01,01,814**		**1,43,62,947**
B	**Reserve for Capital Expenditure out of CPRI generated funds**				
	Opening Balance	36,78,96,349		33,28,96,349	
	Add: Transfer from General Reserve out of o.b.	-		-	
	Add: Provision / contribution made during the year 2017-18	15,00,00,000		3,50,00,000	
	Less: Utilisation during the year	10,26,51,389		-	
	Net Balance B		**41,52,44,960**		**36,78,96,349**
C	**MAINTENANCE, RENEWAL & OBSOLESCENCE RESERVE**				
	Opening Balance	7,21,74,349		7,51,61,897	
	Add: Interest earned, Loan from HO & accrued during the year	48,72,679		57,39,220	
	Add: Additional Security Deposit during the year	1,75,970		4,62,373	
	Less: Utilisation during the year	1,48,36,783		91,89,141	
	Net Balance B		**6,23,86,215**		**7,21,74,349**
	TOTAL (A+B)		**48,77,32,989**		**45,44,33,645**

*** Ref. Schedule 16 Point No.2 Fixed Assets**

Place : Bangalore,
Date: 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

	SCHEDULE 3:	Current Year		Previous Year	
	EARMARKED & ENDOWMENT FUNDS:				
A	**SUPERANNUATION FUND**				
	Opening Balance	527,99,52,037		459,16,50,461	
	Add: Receipts from other organisations	-		2,35,764	
	Add: Contribution during the year	55,00,00,000		55,39,24,902	
	Add: Interest received and accrued	37,68,52,808		37,41,54,945	
	Less: Utilisation for Pension payments	37,28,85,623		24,00,14,035	
	Sub Total	**583,39,19,222**		**527,99,52,037**	
	Add: Security Deposit	13,31,990		10,66,151	
	Add: Pension Payable /Others	7,95,885		82,91,129	
	Net Balance - A		**583,60,47,097**		**528,93,09,317**
B	**PROVIDENT FUND**				
	Opening Balance	36,86,09,394		33,83,52,338	
	Add: Transfer from Other Organisation	1,71,440.00		0	
	Add: Subscriptions & Repayments	6,68,63,668		6,98,12,662	
	Add: Interest Paid / Credited to PF subscribers	2,74,69,703		2,69,01,575	
	Less: Withdrawals	8,59,73,795		6,64,57,181	
	Sub Total	**37,71,40,410**		**36,86,09,394**	
	Add: Balances under Security Deposit etc.,	958		958	
	Opening Balance (Additional Interest)	2,52,90,201		211,95,859	
	Add: Additional Interest earned (Excess of Interest Paid / over interest earned 2,87,22,733-2,74,69,703)	12,53,029		40,94,342	
	Total	2,65,43,230		252,90,201	
	Net Balance - B		**40,36,84,598**		**39,39,00,553**
C	**NEW PENSION SCHEME FUND**				
	(i) Opening Balance (Employee's Contribution)	21,137		21,137	
	Add: Subscriptions/Employees' Contribution	3,783		3,783	
	Add: Interest on Employees' Contribution (cumulative)	8,290		8,492	
	(ii) Opening Balance (Employer's Contribution)	21,136		21,136	
	Add: Employer's Contribution	3,783		3,783	
	Add: Interest on Employer's Contribution (cumulative)	8,290		8,492	
	Sub Total	66,419		66,823	
	Add: Additional Interest earned	1,65,462		1,56,128	
	Add: Balances under Security Deposit etc.,	16,782		16,782	
	Net Balance - C		**2,48,663**		**2,39,733**
D	**OTHER FUNDS**				
	(i) Sponsored Scheme Deposits		13,51,63,711		7,02,08,069
	(ii) IHRD Scheme Deposits		8,69,35,191		-
	TOTAL (A+B+C+D)		**646,20,79,260**		**575,36,57,672**

Place: Bangalore
Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

		SCHEDULE 4	Current Year		Previous Year	
		GRANTS FROM GOVT. OF INDIA, & OTHERS				
A		Under Plan Capital				
		Opening Balance	68,72,38,924		96,85,31,590	
		Add: Grant received during the year	39,53,00,000		47,04,00,000	
		Add: Sale of Assets *	4,92,14,634			
		Add: Sale of Assets *	54,12,783			
		Less: Grant utilised during the year	74,92,69,982		75,16,92,666	
		Less: Grant refunded to M o P during the year	44,67,713		-	
		Grant Balance		38,34,28,646		68,72,38,924
B		Under R&D Plan				
		Opening Balance	11,05,53,687		8,30,20,273	
		Add: Grant received during the year	77,00,000		4,58,50,000	
		Less: Grant utilised during the year	11,11,15,840		1,83,16,586	
		Grant Balance		71,37,847		1105,53,687
C		Under RSoP Scheme				
		Opening Balance	42,36,955		4,58,30,000	
		Add: Grant received during the year	1,20,97,000		1,48,56,000	
		Less: Grant utilised during the year	1,63,33,955		5,64,49,045	
		Grant Balance		-		42,36,955
D		Under NPP Scheme				
		Opening Balance	1,99,45,000		1,64,09,000	
	i)	Add: Grant received during the year	8,84,87,000		12,67,94,000	
		Less: Grant utilised during the year	6,35,41,485		12,32,58,000	
		Grant Balance		4,48,90,515		1,99,45,000
		TOTAL		**43,54,57,008**		**82,19,74,566**

*** Ref. Schedule 16 Point No.2 Fixed Assets**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

		SCHEDULE 5	Current Year		Previous Year	
		CURRENT LIABILITIES AND PROVISIONS				
A		**CURRENT LIABILITIES**				
	1	**Sundry Creditors**				
		a) For Supplies & Services	52,46,155		58,87,164	
		b) For Expenses (Non-Plan)	3,09,43,891		2,49,92,408	
		c) For Expenses (Plan)	2,81,81,326		79,82,962	
		d) For Salaries	4,56,72,180		5,92,78,466	
		e) For Others	3,29,17,786		199,46,72,5	
		f) Interest received on Grant Account to be refunded to M o P	43,19,919		2,03,38,475	
				14,72,81,257		13,84,26,200
	2	**Deposits Received**		55,50,38,472		50,17,20,385
	3	**Statutory Liabilities**		2,02,50,119		94,39,279
	4	**EMD, Security Deposits and others**		11,54,41,295		8,17,65,292
	5	**Reserve for Doubtful debts**		6,28,60,873		6,28,60,873
		TOTAL		**90,08,72,017**		**79,42,12,029**

Rao & Emmar Chartered Accountants BANGALORE

Place: Bangalore,

Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

	SCHEDULE 6	GROSS BLOCK					
	FIXED ASSETS	Cost/valuation As at beginning of the year	Additons during the year (Non-Plan)	Additons during the year (RC-Project)	Transfer from WIP	As at the Current year end	As at the Previous year end
A	FIXED ASSETS:						
1	LAND: Freehold	6,96,84,860	-	-	-	6,96,84,860	6,96,84,860
2	BUILDINGS ON FREEHOLD LAND	96,68,71,164	3,28,86,444	-	79,14,534	100,76,72,142	96,68,71,164
3	PLANT MACHINERY & EQUIPMENT	607,07,00,575	3,99,56,937	92,88,106.00	6,34,46,134	618,33,91,752	607,07,00,575
4	VEHICLES	51,40,342	94,346	-	-	52,34,688	51,40,342
5	FURNITURE, FIXTURES	2,51,34,108	33,63,924	-	5,63,088	2,90,61,120	2,51,34,108
6	LIBRARY BOOKS & FILM	1,50,39,571	5,06,356	-	-	1,55,45,927	1,50,39,571
7	MACHNERY & EQUIPMENTS (SPONSERED PROJECTS)	18,41,95,325	3,77,62,813	-	-	22,19,58,138	18,41,95,325
	TOTAL	**733,67,65,945**	**11,45,70,820**	**92,88,106.00**	**7,19,23,756**	**753,25,48,627**	**733,67,65,945**
B	CAPITAL WORK-IN-PROGRESS	96,69,91,329	74,92,69,982		(7,19,23,756)	164,43,37,556	96,69,91,329
	CAPITAL WORK-IN-PROGRESS (CPRI GRANT PORTION)	71,03,651.00	10,26,51,389			10,97,55,040	71,03,651
	LESS: DEPRECIATION provided upto 31-03-2018	205,19,73,790	19,77,67,692			224,97,41,482	205,19,73,790
	GRAND TOTAL	**625,88,87,135**				**703,68,99,740**	**625,88,87,135**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

	SCHEDULE 7	Current Year	Previous Year
	INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
A	**SUPERANNUATION FUND INVESTMENT ACCOUNT**		
	1 In Government Securities	-	-
	Investment in LIC of India, under Superannuation Scheme	533,76,87,128	469,28,80,132
	2 Bonds	-	-
	3 Term Deposits with Banks & Financial Institutions	-	-
	4 Interest Accrued on Superannuation Fund Investments	-	1,89,80,462
	5 TDS / Receivables	2,24,87,364	2,24,87,364
	6 Cash at Bank (S.B. Account No.10356553751)	1,70,41,670	10,36,457
	Total - A	**537,72,16,162**	**473,53,84,415**
B	**PROVIDENT FUND INVESTMENT ACCOUNT**		
	1 In Government Securities	54,34,189	54,34,189
	2 Bonds	28,00,00,000	4,50,00,000
	3 Term Deposits with Banks & Financial Institutions	10,20,00,000	30,00,00,000
	4 Interest Accrued on Provident Fund Investments	75,91,328	2,04,59,528
	5 TDS Receivables	29,25,366	17,08,032
	6 Cash at Bank (S.B. Account No.10356553740)	57,33,716	212,98,804
	Total - B	**40,36,84,599**	**39,39,00,553**
C	**NEW PENSION SCHEME FUND INVESTMENT ACCOUNT**		
	1 Cash at Bank (S.B. Account No.30019323462)	2,48,663	2,39,733
	Total - C	**2,48,663**	**2,39,733**
	Total (A+B+C)	**578,11,49,424**	**512,95,24,701**

Place : Bangalore,

Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2018

(Amount in ₹)

		SCHEDULE 8	Current Year		Previous Year	
		CURRENT ASSETS, INVESTMENTS, LOANS & ADVANCES				
A		**CURRENT ASSETS:**				
	1	**Inventories:**				
		a) Stores and Spares		3,793	3,793	
		Less: Provision for diminision in Value of stores stock	-		-	3,793
	2	**Sundry Debtors:**				
		a) Debts Outstanding for a period exceeding six months	26,70,45,465		23,25,63,371	
		b) Debts Outstanding for a period not exceeding six months	11,92,91,516	38,63,36,981	12,45,55,926	35,71,19,297
	3	**Cash balances in hand (including cheques/drafts and imprest)**		1,64,208		22,36,173
	4	**Deposits and Bank Balances:**				
		a) Deposits with Scheduled Banks (includes Non Plan Margin Money)	1,89,57,000		1,57,95,072	
		b) Margin Money Deposits on Grant account	26,24,76,000		32,28,86,500	
		c) Deposits earmarked for Superannuation Fund	55,00,00,000		55,39,24,902	
		d) Savings Accounts	40,88,67,323	124,03,00,323	84,05,40,783	173,31,47,257
		e) Deposits of Maintenance, Renewal & Obsolescence Reserve	6,25,00,000		6,45,00,000	
		f) Savings Bank account of Maintenance, Renewal & Obsolescence Reserve	2,54,196		63,52,328	
		g) Accrued interest on MRO Fund & TDS Receivable, etc.,	16,32,019	6,43,86,215	13,22,021	7,21,74,349
B	I	**Investments**				
		a) Investment in Shares of Joint Venture Company, M/s National High Power Test Laboratory Pvt Ltd., New Delhi	30,40,00,000		2390,00,000	
		Add: Amount paid for allotment of Additional Shares	-	30,40,00,000	650,00,000	30,40,00,000
		b) Long Term Investments				
		Government Securities	3,10,58,749		310,58,749	
		Bonds	222,29,91,172		176,25,00,000	
		Long Term Deposits with Banks & Financial Institutions	-	225,40,49,921	17,50,00,000	196,85,58,749
C		**LOANS, ADVANCES & OTHER ASSETS**				
		a) Deposits with Govt.Depts & others	8,04,92,387		8,45,58,930	
		b) Advances to Employees	93,37,780		90,55,027	
		c) Prepaid Expences	15,44,274		22,30,329	
		d) Accrued interest	16,00,57,676		13,05,51,160	
		e) TDS Receivables	44,42,42,163		37,53,21,243	
		f) Claims Receivable	2,03,13,846		2,27,52,864	
		g) Other Advances	3,35,03,767		4,41,50,439	
		h) Loan to NHPTL	6,00,00,000	80,94,91,893	-	66,86,19,992
		TOTAL		**505,87,33,334**		**510,58,59,610**

Place : Bangalore,
Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 9	Current Year	Previous Year
	INCOME FROM TEST FEE & CONSULTANCY		
a)	**Test Fee**	146,42,65,593	146,98,90,075
b)	**Consultancy Services Charges**	19,56,73,384	14,48,92,980
	TOTAL	**165,99,38,977**	**161,47,83,055**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 10	Current Year	Previous Year
	FEES		
a)	**Training Fee**	117,36,996	92,03,459
b)	**Seminar Fee**	93,76,241	120,76,130
	TOTAL	**2,11,13,237**	**2,12,79,589**

Rao & Emmar* Chartered Accountants BANGALORE

Place : Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 11	Current Year	Previous Year
	INTEREST EARNED		
a)	**Interest on Term Deposits with Banks & Financial Institutions**	22,09,49,826	19,34,70,628
b)	**Interest on Loans & Advances to Employees**	12,08,042	14,70,980
	TOTAL	**22,21,57,868**	**19,49,41,608**

Place : Bangalore,
Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

		SCHEDULE 12	Current Year	Previous Year
		OTHER INCOME		
1)		**Fees for Miscellaneous Services**		
	a)	Sale of Publications	4,66,612	7,78,227
	b)	Library Receipts	2,175	7,845
2)		**Miscellaneous Income**		
	a)	Application fee on recruitment	8,000	5,500
	b)	Sale of Tender forms	2,45,700	2,68,600
	c)	Licence fees	24,58,276	27,51,513
	d)	Rent Receipts	30,72,492	32,42,068
	e)	Sale of Scrap	1,36,330	32,921
	f)	Others	8,61,392	4,03,652
		TOTAL	**72,50,977**	**74,90,326**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 13	Current Year	Previous Year
	RESEARCH ESTABLISHMENT EXPENSES		
a)	Salaries and Wages including Bonus	54,49,13,441	50,65,84,931
b)	Staff Welfare Expenses	2,67,25,871	2,52,28,885
c)	Expenses on Employee's Retirement and Terminal Benefits	55,00,00,000	55,39,24,902
d)	Expenses on Medical Facilities	1,59,72,828	1,83,32,892
	TOTAL	**113,76,12,140**	**110,40,71,610**

Rao & Emmar * Chartered Accountants * BANGALORE

Place: Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 14	Current Year	Previous Year
	RESEARCH ADMINISTRATIVE EXPENSES		
a)	Electricity and Power	7,82,38,117	7,46,23,651
b)	Water Charges	7,30,415	16,93,194
c)	Office Expenses	5,29,42,794	5,18,84,978
d)	Repairs and Maintenance	17,32,42,197	15,80,99,736
e)	Rent, Rates and Taxes	10,02,664	11,69,583
f)	Vehicles Running and Maintenance Expenses	33,05,970	40,47,799
g)	Postage, Telephone and Communication Charges	36,67,395	38,81,590
h)	Printing and Stationary	16,75,578	20,57,603
i)	Travelling and Conveyance Expenses	1,48,34,151	1,62,17,573
j)	Expenses on Seminar & Workshops	87,23,785	78,26,672
k)	Subscription Expenses	19,467	88,407
l)	Expenses on Fees	71,333	72,327
m)	Auditors Remuneration	1,75,000	1,75,000
n)	Professional Charges	51,72,295	37,26,022
o)	Library Expenses	37,27,933	51,96,073
p)	Training Expences	13,51,790	13,76,552
q)	Publication Expenses	5,55,338	8,10,048
r)	Advertisement and Publicity	36,03,322	94,50,081
s)	Provision for Doubtful Debts	-	6,28,60,873
	TOTAL	**35,30,39,543**	**40,52,57,762**

Rao & Emmar Chartered Accountants BANGALORE

Place: Bangalore,
Date : 17-09-2018

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CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2018

(Amount in ₹)

	SCHEDULE 15	Current Year	Previous Year
	DEPRECIATION		
a)	**Depreciation for the year**	19,77,67,692	19,13,95,931
	TOTAL	**19,77,67,692**	**19,13,95,931**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date : 17-09-2018

CENTRAL POWER RESEARCH INSTITUTE
Schedule forming part of Income & Expenditure for the year ended 31st MARCH 2018

SCHEDULE 16
DEPRECIATION

	GROSS BLOCK				DEPRECIATION				NET BLOCK	
YEAR	OB	Additions		TOTAL	%	OB	For the Year	Total	OB	CB
		Additions	Transfer from W-I-P to Assets							
1	2	3	4	5		6	7	9	10	11
				(2+3-4)				(6+7-8)	(2-6)	(5-9)
Land	6,96,84,860	-		6,96,84,860					6,96,84,860	6,96,84,860
Buildings	96,25,91,197	3,28,86,444	79,14,534	1,00,33,92,175	3	41,08,37,296	3,09,57,784	44,17,95,079	55,17,53,901	56,15,97,096
Buildings (ICICI)	42,79,967	-	-	42,79,967	3	15,21,200	1,42,951	16,64,151	27,58,767	26,15,816
Plant & Machinery	6,02,59,85,734	4,92,45,043	6,34,46,134	6,13,86,76,911	5	3,94,51,52,745	15,46,54,211	4,09,98,06,956	2,08,08,32,989	2,03,88,69,955
Plant & Machinery (ICICI)	4,47,14,841	-	-	4,47,14,841	5	2,53,04,702	21,23,955	2,74,28,657	1,94,10,139	1,72,86,184
Plant & Machinery (Spons)	18,41,95,325	3,77,62,813	-	22,19,58,138	5	8,79,54,547	79,24,495	9,58,79,043	9,62,40,778	12,60,79,095
Furniture & Fixtures	2,51,34,108	33,63,924	5,63,088	2,90,61,120	6	1,42,53,154	14,74,295	1,57,27,449	1,08,80,954	1,33,33,671
Vehicles	51,40,342	94,346	-	52,34,688	10	48,52,205	8,963	48,61,167	2,88,137	3,73,521
Library Books	1,48,14,418	5,06,356	-	1,53,20,774	95	1,40,73,696	4,81,039	1,45,54,735	7,40,722	7,66,039
Films (docmntry)	2,25,153	-	-	2,25,153	95	2,13,895		2,13,895	11,258	11,258
Sub Total	**7,33,67,65,945**	**12,38,58,927**	**7,19,23,756**	**7,53,25,48,627**						
Capital Works in Progress (M o P)	96,69,91,329	74,92,69,982	7,19,23,756	1,64,43,37,556					96,69,91,329	1,64,43,37,556
Capital W-I-P (CPRI)	71,03,651	10,26,51,389	-	10,97,55,040					71,03,651	10,97,55,040
TOTAL	**8,31,08,60,925**	**97,57,80,297**		**9,28,66,41,222**		**4,50,41,63,439**	**19,77,67,692**	**4,70,19,31,131**	**3,80,66,97,486**	**4,58,47,10,091**

Place: Bangalore,
Date : 17-09-2018

Rao & Emmar Chartered Accountants BANGALORE

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Schedule – 16

Significant Accounting Policies attached to and forming part of Accounts for the year ended 31st March 2018.

Background: - The Institute, an autonomous body under Govt. of India, Ministry of Power established through a resolution vide No.33 (14)/74-Policy: dated 21/10/1974 is totally focused on Power Research. The Institute has been recognized by Ministry of Science & Technology as an S&T Institution. The Institute has been further recognized as Scientific and Industrial Research Organization by Government of India, Ministry of Science and Technology vide their letter No. 11/68/88-TU-V, dated 05/04/2017 and valid up to 31.03.2020. The Institute as a legal entity is registered with the Registrar of Societies. The basic objectives of the Institute is to serve as a National Testing & Certification Authority and act as an apex body for initiating and coordinating Research and Development in the field of electric power. The Government of India is supporting the activities through grants. Additionally, the Institute is generating revenue for regular maintenance through test fees and professional services rendered to Government organizations/Electricity Boards/Commercial organizations etc.

1. Method of Accounting:

The financial statements have been prepared to comply with the Generally Accepted Accounting Principles. The financial statements have been prepared under the historical cost convention on an accrual basis. The accounting policies have been consistently applied by the Institute. The Bonus paid to employees are accounted in the year of payment.

2. Fixed Assets:

Fixed assets are stated at cost. Cost comprises the purchase price and any attributable cost of bringing the asset to its working condition for its intended use. Financing costs relating to acquisition of fixed assets are also included to the extent they relate to the period till such assets are ready to be put to use.

The Grants are contribution by Govt. of India towards total capital outlay of Projects and no repayment of the same is ordinarily expected. Fixed assets acquired under Capital Projects, R & D Plan, Sponsored Schemes and loans are stated at their original cost of acquisition. The funds provided for acquisition of these Fixed Assets under Grant-in-Aid from Government of India / other Agencies are exhibited as Capital Reserve.

Fixed Assets acquired out of Non Plan funds were being capitalized @ Rs.1-00 per asset and the balance amount charged to Income & Expenditure account from the financial year 2002-03 to 2014-15. From the financial year 2015-16, fixed assets acquired out of Non Plan funds are capitalized at full value and depreciation provided as applicable.

The Institute is a non-profit organization and therefore depreciation on assets capitalized was not provided in the accounts up to 2006-07. However, as per the decision of the Governing Council (G.C), the Depreciation was provided on the new Schemes from 2007-08 as per the rates provided in the Income Tax Rules, 1962 on written down value basis. Further, the G.C in its meeting held on 16th Nov 2009, instructed the Institute to provide depreciation from the financial year 2009-10 on all assets and the Government of India vide No.4/11/2009-T&R dated 30-03-2010 directed to provide depreciation every year by a charge to the Income & Expenditure Account on Straight line method basis.

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Accordingly, the depreciation has been provided from 2009-10 on Straight line method as per the rates determined by the Management (based on the useful life of the assets) on all the assets and the total depreciation not provided for upto 31st March 2018 is of the order of Rs.245,21,89,649-00(for assets additions from 1981).

There is a difference between the Capital Reserve and Fixed Asset Gross block to the tune of Rs.5.51 Crores. **1.** During the financial year 2010-11 an amount of Rs.482.34 lakhs being the proceeds of sale of assets at TRC, Koradi was received and was reduced in Fixed Asset schedule but not in Capital Reserve. The same is rectified by reducing in Capital Reserve and added to Unspent Grant balance during the year 2017-18. **2.** During the financial year 2009-10 an amount of Rs.9.81 lakhs being the proceeds of sale of assets was received and was reduced in Fixed Asset schedule but not in Capital Reserve. The same is rectified by reducing in capital Reserve and added to Unspent Grant balance during the year 2017-18. **3.** Similarly an amount of Rs.495.00 lakhs was capitalized, during the Financial Year 2005-06 to 2010-11 out of loan which was completely paid back by CPRI out of Internal Resources. But actual assets added to Fixed Asset Schedule was Rs.489.95 lakhs. Thus difference of Rs.5.05 lakhs was rectified by reducing in capital Reserve and added to General Reserve. **4.** Similarly the surplus on sale of Fixed Asset of Rs.54.13 lakhs as on 31-03-2017 has been added to the Capital Reserve was rectified by reducing in Capital Reserve and added to Grant balance during the year 2017-18. The Gross Value of Assets is Rs.928.66 Crores. The Capital Reserve is Rs.959.06 Crores. The Difference is Equity Participation in NHPTL of Rs.30.40 Crores.

Depreciation on Library Books & Films (Documentary) charged at 95% of Book Value.

Capital work-in-progress includes expenditure on Civil Works of projects, which have not been completed as at the end of the year.

3. **Investments:** Investments are shown at cost.

4. **Inventories:**
Inventories of stores and spares are shown at cost and cost includes expenses incurred for procuring the same wherever directly attributable. All consumables purchases are charged off at the time of procurement.

5. **Research and Development:**
Research expenditure on Research and Development is charged against the receipt of research grants. Capital expenditure on Research & Development is treated in the same manner as expenditure on other fixed assets.

6. **Foreign Currency Transaction:**
Transactions in Foreign Currency are recorded at a notional rate of exchange.

Realized gains and losses on Foreign Currency transactions are effected in the Income and Expenditure Account. The balances are recast at the end of the year based on the rate prevailing as On 31st March.

7. **Revenue Recognition:**
The Revenue in respect of Test Fees and Consultancy charges are accounted on completion of work / report. The policy of the Institute is to account the 'TDS Receivables 'on receipt of Form 16 from the client. The Institute is under correspondence with users to get the Form 16 to the extent of around Rs.437.65 Lakhs.

Interest income on deposits relating to CPRI with banks is recognized on time proportionate basis.

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Rao & Emmar Chartered Accountants BANGALORE

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8.Retirement Benefits:

(i) Post – employment benefit plans:

(a) Defined Contribution Plan –
Contribution to New Pension Scheme are accrued in accordance with applicable statute and managed as per Government rules and regulations.

(b) Defined Benefit Plan
The liability towards retirement benefits like Pension, Gratuity and Leave Encashment are ascertained on the basis of Projected Unit Credit Method with actuarial valuation and provided in the books of accounts.

(ii) Short term employment benefits:
The undiscounted amount of short term employee benefits expected to be paid in exchange for services rendered by employees is recognized during the period when the employee renders services. These benefits include compensated absence and other incentives.

(iii) Pension payments:
Pensions payments are accounted for April to March every year.

As per our report of even date
for RAO &EMMAR.,
Chartered Accountants,
FRN 003084S

(C.S.MURALI KRISHNA)
Chief Accounts Officer

(V.S. NANDAKUMAR)
Director General

(ADARSH N A)
Partner
Membership No.240166

Place: Bangalore,
Date: 17-09-2018.

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Notes on Accounts & Contingent Liability attached to and forming part of Accounts for the year ended 31st March 2018.

1. **Fixed Assets and Depreciation:** -Upto 2002-03, the Institute capitalized all costs relating to the acquisition and installation of all fixed assets. From the year 2002-03 onwards, the Institute has changed its policy for accounting capital assets as under

   - ➔ All assets acquired under Capital Projects, R&D Plan, Sponsored Schemes, RSOP Schemes are capitalized with all costs relating to their acquisition.

   - ➔ All assets acquired-out of Non-Plan (Revenue) expenditure of the Institute were charged off to the Income & Expenditure account from the financial year 2002-03 to 2014-15. Total value of assets charged off from 2002-03 to 2014-15 is Rs.1691.00 lakhs. In the financial year 2015-16, the Institute started to capitalize 'at cost' all assets acquired out of Non-Plan (Revenue) expenditure and depreciation provided as applicable.

   - ➔ The Institute is maintaining a fund "Maintenance, Repairs and Obsolescence – Fund" by charging certain amount to the Income & Expenditure Account. The Institute is utilizing this fund towards revenue and certain capital expenses. As the charge is already provided to the Income & Expenditure account, depreciation is not provided on such assets acquired out of this fund. The value of such assets is Rs.148.37 lakhs for 2017-18 (Rs.91.89 lakhs for the previous year) and Rs.1252.85 lakhs upto 2017-18.

2. **Government Grant:** - Grant received from the Government of India and other organizations towards specific projects are shown as capital/sponsored grants. The Institute confirms compliance of all the conditions of the grant. The Institute consistently has followed the procedure of showing the assets procured from such grants under the Fixed Assets.

   Upgradation of Energy Meter, Impulse current generator facilities at Bangalore and setting up of type test facility for Instrument Transformers at UHV, Hyderabad (Project No.1202) was the 1st Batch project under XII PLAN with sanction cost of Rs.12.17 crores. While executing the expenditure happened to be Rs.12.67 crores due to F.E. Variation/Escalation in procurement of Equipment. The additional Expenditure of Rs.50.70 lakh has been absorbed from the Internal Resources.

3. **Reserve for Capital Expenditure out of CPRI generated funds:** -
   (a) Ministry of Power, Government of India, vide letter No. 5/4/2013-T&R dated 25-02-2014 while conveying approval for the project 'Augmentation of New Facilities Projects' for Rs.105.90 Crores has directed C.P.R.I. to (i) bear 10% of the total outlay of the projects i.e., Rs.10.59 Crores and (ii) also bear additional funds, if any required over and above the approved outlay including any escalation of FE component of the project, from its internal resources. In the same way Ministry of Power, Government of India, vide letter No. 5/5/2014-T&R dated 05-01-2015 while conveying approval for the project 'Augmentation of High Power Short Circuit Test facilities and establishment New Facilities Projects' for Rs.996.10 Crores, has directed C.P.R.I. to (i) bear 10% of the total outlay of the projects i.e., Rs.99.61 Crores and (ii) also bear additional funds, if any required over and above the approved outlay including any escalation of FE component of the project, from its internal resources.

   The total amount to be contributed by C.P.R.I. on account of above mentioned projects is Rs.110.20 Crores. To meet the above expenditures, C.P.R.I. has created a reserve by name "Reserve for Capital Expenditure out of CPRI generated funds" and the credit balance under this reserve as on 31-03-2018 is Rs.41.52 crores.

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(b) In accordance with the approval of Government of India, Ministry of Power vide letter No. 5/18/2007- T&R dated 16-01-2012, an amount of ₹ 2,390.00 lakhs has been paid towards initial equity contribution in M/s National High Power Test Laboratory Pvt Ltd., New Delhi, (M/s NHPTL) a Joint Venture Company of 5 equity partners viz., NTPC, NHPC, POWERGRID , DVC & C.P.R.I. The total equity share of C.P.R.I. would be Rs. 2,400.00 lakhs being 1/5th equal share of the total equity capital of Rs.12,000.00 lakhs, equally shared by all the 5 equity partners. 2,39,00,000 shares of Rs.10.00 each for total amount of Rs.2,390.00 lakhs was allotted and Share Certificates have been issued to C.P.R.I. M/s N.H.P.T.L, called for allotment of 1,00,000 shares of Rs.10.00 each during February 2017 and the same was paid to M/s N.H.P.T.L.

M/s N.H.P.T.L. has decided to increase its Equity capital. Hence it has asked C.P.R.I. to pay an amount of Rs.640.00 lakhs, towards allotment of 64,00,000 shares of Rs.10.00 each. Ministry of Power, Government of India, has asked C.P.R.I. to make this investment of Rs.640.00 lakhs out of its own Funds / Reserve and accordingly the amount of Rs.640.00 lakhs was paid to M/s N.H.P.T.L. during February 2017. The shares were allotted to us and the share certificate for Rs.650.00 lakhs has been received.

M/s. N.H.P.T.L. requested to provide temporary loan of Rs.600.00 lakhs from each JV Partner vide letter no.NHPTL/JVs/1643 dated 21.03.2018 towards repayment of loans to M/s. Power Finance Corporation. The same was paid on 28.03.2018 from CPRI General Reserve with the approval of Ministry of Power vide letter no.31-4/1/2018-T&R dated 27.03.2018 for a period of 3 months.

4. **Retirement Benefits**:- The liability on account of Pension, Gratuity etc., was evaluated as on 31.03.2018 through M/s Trans Value Consultants (Actuaries and Financial Consultants) and the liability has been estimated at Rs.55901.05 lakhs. The Governing Council at its meeting held on 17.10.2007, directed for meeting the liability from internal resources/charging to Income & Expenditure Account.

As such Rs.3101.53 lakhs was required to be provided. However considering steady decline of interest rates on investment, a sum of Rs.5500.00 lakhs has been charged to Income & Expenditure Account during the current year. The cash of Rs.5500.00 lakhs will be transferred to Superannuation Fund during the financial year 2018-19.

5. **Income Tax Cases** :-

(a) Institute was notified by the Government of India, Ministry of Finance, Department of Revenue vide Notification No.178/2007 (F.No.203/38/2006/ITA-II), dated 24.5.2007 in the category of 'other institution' partly engaged in research activities for the purpose of Clause (ii) of Sub Section (1) of section 35 of the Income Tax Act 1961 read with rules 5C & 5D of the Income Tax Rules, 1962 effective from 01.04.2005. The Income of the Institute was allowed as exempt from Income Tax under section 10(21) of the IT Act 1961 up to the Assessment year 2005-06. However, the Income Tax Department has re-opened the Assessment for the assessment years from 2001-02 to 2006-07 (Financial years 2000-01 to 2005-06) under section 143, 147& Sec 263 on the grounds that the exemption under Sec.10 (21) is available to Scientific Research Association notified as such under section 35(1)(ii) of the IT Act and not to "Institution"/ "other institution".

In view of the above, CPRI had filed writ petition (W.P. Nos. 50838 & 56636-56637/2013) on 11-11-2013 before H'onble High court of Karnataka for notifying CPRI as 'Scientific Research Institute" under section 35(1)(ii) of the Income tax act, 1961. H'onble High court disposed off the petition on 26.11.2014 by quashing the Notifications dated 30.01.2004 and 24.05.2007 and the clarification dated 28.08.2006 issued by CBDT. Further, the Hon'ble High Court directed CPRI to make a fresh representation before CBDT and explain the nature of activities carried out, which shall be taken into consideration by the CBDT while considering the claim of exemption.

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The Institute had applied to CBDT on 09.04.2015 as per the directions of the Hon'ble High Court for recognition as a 'Scientific Research Association'. The CBDT vide Notification No.27/2017(F.No. 203/32/2015/ITA-II) dated 07-04-2017 has notified C.P.R.I. in the category of 'Scientific Research Association' under Section 35 and sub section (i) and (ii) of Income tax Act 1961 from Assessment Year 2003-2004 onwards and consequently C.P.R.I. has become eligible for exemption from Income Tax under section 10 (21) of the Income Tax Act 1961.

On receipt of above Notification, C.P.R.I. has applied for refund of TDS of Rs.5278.80 lakhs from Assessment Years 2003-2004 to 2017-2018.

Sl. No.	A.Y.	Issue and status of the of the cases as on 31.03.2018
1	2001-02	Department has raised Demand of Rs.1154.61 lakhs vide notice dated 12.12.2008 for the AY 2001- 02- to 2004-05, 2006-07 and for demand for Rs.135.45 lakhs dt. 13.9.2011 for 2007-08. The order of CIT (A) appeals was in favour of the Institute against which department was gone on appeal in the ITAT. ITAT was quashed the appeal and ordered in favour of the Institute on exemption in accordance u/s section 10 (21)
2	2002-03	
3	2003-04	
4	2006-07	
5	2007-08	
6	2005-06	Department has raised Demand of Rs.137.71lakhs vide notice dated 31.12.2007. The order of CIT (A) appeals was in favour of the Institute against which department had gone on appeal in the ITAT. ITAT has quashed the appeal and ordered in favour of the Institute on account of refund the case to Assessing Officer on exemption under section 10 (21)
7	2009-10	Department has raised a demand of Rs. 3139.57. The Institute had filed an appeal to the Commissioner of Income Tax appeals, Bangalore, who had considered in the Institute favour and directed the Assessing Officer to act upon accordingly under section 10(21) of IT Act 1961.
8	2010-11	
9	2011-12	
10	2012-13	
11	2013-14	Department has raised a demand of Rs.271.76. The advocate for CPRI appeared before ITA-13, Bangalore and submitted the appeal. Requested the Assistant Commissioner of Income Tax, Bangalore and forwarded the copy of notification No.27/2016 dt.7.4.2016 from CBDT notifying the CPRI from assessment year 2003-2004 onwards in the category of "Scientific Research Association under section 35(1)(ii) and requested to close the proceedings.
12	2011-12 2012-13 2013-14 2014-15	Income Tax raised demand of Rs.144.82 lakhs under section 201(1) and 201(1A) of IT Act for perquisite tax on account provision of rent free accommodation to employees against the orders appeals were filed before the commission of Income Tax and stay of demand of recovery obtained in respect of demand. CPRI filed appeals before the ITAT and deposited Rs.37.36 lakhs subsequently ITAT issued order all 4 appeals filed by the CPRI is partly allowed.

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6. **Service Tax Cases:-**

A) As per order no. 35/Commr/ST/ADJ/BPL-I/2014 dated 31.01.14, the Commissioner, Central Excise & Service Tax, Bhopal has raised a demand of Rs. 8,09,51,984/- (Service Tax, Interest and Penalty) alleging non-payment of Service Tax on Advance Payment received during the period July 2005 to June 2011. An appeal is filed against the said order with the CESTAT, New Delhi on 24.4.14 which is pending for adjudication.The Hon'ble Tribunal Bench of CESTAT vide its Order dated 07-10-2015 has ordered for a deposit of Rs.5,67,91,862/- . The Institute complied with the Order and deposited Rs.5,67,91,862/- being the demand of Service Tax along with Interest. An appeal has been filed on 22.11.2017 in the Hon'ble High Court of M.P Jabalpur and the case is pending.

B) The Asst. Commissioner of Service Tax Service Tax Division II, Bangalore vide Order No.28/2013, dated 24.06.2013 has raised a demand of Rs.52,952/- as Interest on belated payment of Service Tax on Advance Deposits. The Institute has filed an appeal before the commissioner of central excise against the Adj. Order on 14-09-2013.

C) A Show Cause Notice No.C.No.IV/01/51/2013 ST Divn.II/1973/13, Dt 09/05.2013 issued, demanding Rs.2,06,712/- being ineligible cenvat credit claimed on "Hiring of Vehicles" and "Catering Services" during the year 2011-12. A reply was given to this Show Cause Notice vide letter dated 30.08.2013. On receipt of reply from CPRI, a demand for Rs.1,13,410/- towards CENVAT on catering services was allowed vide Order No. 32/2015 dated 27-11-2015. The authorities disallowed CENVAT credit of Rs.93,302/- on 'rent-a-cab' for which CPRI has filed an appeal for availing CENVAT credit.

D) The audit team of Service Tax department audited the accounts for the period from October 2013 to March 2015. In the Audit Report, they demanded to pay a sum of Rs.25,46,328/- , out of which an amount of Rs.2,79,494/- was remitted. CPRI filed an appeal for remaining amount of Rs.22,66,834/- and the case is pending.

7. **Other Cases :-**

CPRI had received a request for refund of unutilized test charges of Rs.4,10,900/- from M/s. Jabshetty Transformers, Gulburga during the month of May 2016 through their representative, Shri B Puttaraju who was a regular visitor to the Institute on behalf of M/s. Jabshetty Transformers. For transferring the amount, CPRI had requested M/s. Jabshetty Transformers for RTGS details which they provided through an email. Based on the RTGS details given by them, CPRI transferred Rs.4,10,900/- to the account as provided ie. M/s. M&CDCC Bank Ltd., Mysore

On informing M/s. Jabshetty Transformers through email about the transfer of the above amount, they informed back that they did not ask for refund/transfer and also no money had reached to their account. On enquiry it was found that Shri B Puttaraju, the representative of the M/s.Jabshetty had fictitiously created another account in the name of M/s.Jabashetty Transformers in M&CDCC Bank Ltd., Mysore.

M/s.Jabshetty Transformers has sent legal notice for refunding the amount which was transferred to M/s. Jabashetty Transformers Account. This is being defended by our Legal Advisers, Ravi, Suri &Sunitha, Malleswaram, Bangalore. A case was also filed in this regard, in the Sadasivanagar Police Station on 20th Oct. 2016. The matter is still pending.

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8. **Contingent Liabilities**: -

a) On account of Letter of Credit opened and remaining to be honored – NIL (excepting Letter of credits with 100% margin) (NIL for 2016-17).

b) Estimated amount of liability on account of capital contracts – Rs.2434.25 lakhs. (Rs.5,430.98 lakhs for 2016-17).

c) Claims not acknowledged as debts by the Institute – NIL

d) Bank Guarantees furnished to various clients by the Institute is of the value of Rs. 1079.49 lakhs for 2017-18 (Rs. 676.01 lakhs for 2016-17), backed by deposits to the full extent.

e) The total amount of Demand received from Service Tax Department (as provided in para 6 above) is Rs. 836.44 Lakhs.

9. **Sponsored Projects** :-
The Institute is engaged in core research activity funded by Government Grants. Apart from this, research activity for Government, Semi-Government and private agencies are also carried out on Sponsored basis. The cost of such research is fully funded by such agencies. The element of service if any in such activity is separately identified and charged.

10. The total unknown remittance received as on 31.03.2018 was Rs.8,88,35,224.00. The balance being reviewed in relation to Sundry Debtors and being reconciled as a Continuous Process.

11. The Institute has a system of Internal Audit conducted by a firm of Chartered Accountants.

12. The grant balances shown at Schedule–4 are exclusive of margin money deposits for LC establishment towards the import of equipments. The margin money deposits as on 31.03.2018 are Rs. 2624.76 lakhs (Rs. 3228.87 lakhs as on 31.03.2017).

13. Accrued Interest on Investments made in Public Sector Undertakings is calculated based on simple interest method.

14. Figures for the previous year have been regrouped wherever necessary to conform to the presentation of the current year.

As per our report of even date
For RAO & EMMAR
Chartered Accountants
FRN 003084S

(C.S.Murali Krishna)
Chief Accounts Officer

(V.S. Nandakumar)
Director General

(ADARSH N A)
Partner
Membership No. 240166

Rao & Emmar's BANGALORE Chartered Accountants

Place: Bangalore,
Date: 17-09-2018.