CENTRAL POWER RESEARCH INSTITUTE

Annual Report 2019 - 20

FOREWORD

The year 2020 is memorable year for CPRI as CPRI is celebrating it's Diamond Jubilee Year, on completion of 60 years of service to the fraternity of Electrical Industry.

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

- **National Conference on "Latest Trends and Developments in Low Voltage Switchgear, Controlgear and Associated Assemblies" LTCON – 2019**

  National Conference on "Latest Trends and Developments in Low Voltage Switchgear, Controlgear and Associated Assemblies" LTCON – 2019, was organized by Short Circuit Laboratory at Bengaluru, **on 20th September 2019.**

- **National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies"**

  One day National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies", was organised by STDS-CPRI, Bhopal, at STDS-CPRI, Bhopal, on 15th November 2019.

- **National Conference on "Transformers and Allied Equipment"**

  National Conference on "Transformers and Allied Equipment" was organised by High Power Laboratory, CPRI, Bengaluru,at **Bengaluru, o**n 19th & 20th December 2019.

- **National Seminar on "Testing & Certification of Transformer"**

  National Seminar on "Testing & Certification of Transformer as per IS:2026:IEC:60076", was organized by STDS-CPRI, Bhopal, at STDS-CPRI, Bhopal, on 3rd January 2020.

- **National Conference on Recent trends in High Voltage Engineering & Technology (NCHVET-2020)**

  National Conference on "Recent trends in High Voltage Engineering & Technology (NCHVET-2020)", was organized by UHVRL-CPRI, Hyderabad, at UHVRL - CPRI, Hyderabad, on 24th January 2020.

- **National Seminar on "Grid connected Inverters"**

  National Seminar on "Grid connected Inverters" was organised by Energy Efficiency & Renewable Energy Division, CPRI, Bengaluru, at CPRI, Bengaluru, on 24th January 2020.

- **National Conference on "LT/HT Switchgear & Control gear-Smart Technologies"**

  National Conference on "LT/HT Switchgear & Control gear-Smart Technologies", was organized by STDS-CPRI, Bhopal, at Bhopal, on 28th & 29th February 2020.

CPRI has been fortunate to get a large chunk of 12th Five Year Plan funding to the extent of Rs.1182.00 crores for the three major capital projects & R&D Schemes. These projects are under implementation and will pave way for upgrading CPRI test facilities to the global level. CPRI will be geared up for rendering advanced research and the state-of-the-art testing services in the years to come. Important facilities proposed under these projects are:

- Additional Short Circuit Generators for High Power Laboratory, Bengaluru (Enhancing the capacity from 2500 MVA to 7500 MVA)
- Establishment of Regional Testing Laboratory at Nashik
- Relocation of Thermal Research Centre-CPRI, Nagpur
- Temperature rise test (40 kA) facility at High Power Laboratory-CPRI, Bengaluru
- Enhancement of Oil test facilities & Energy meter test facilities
- Smart Grid and Phasor Measurement Unit Laboratory

The total receipts for the year was Rs.160.08 crores. The officers of CPRI have published/ presented a total of 190 technical papers including papers in the International Conferences & Journals. The events numbering 73 organized by CPRI under Conferences/Seminars/ Workshops/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 one patent during the year and five patents were granted during the year.

On the consultancy front, CPRI has been carrying out numerous Third Party Protection Audits for PGCIL, UPPTCL, PPGCL, BBMB, M/s G.E., M/s. Adani Electricity, Goa Power systems, Chutak Hydro Power Plant, National Hydro Power Corporation in a big way. Energy audit studies were carried out at M/s. Meenakshi Mission Hospital and Research Centre, Madurai & M/s. Brahmos Aerospace Pvt. Ltd., Nagpur. In addition, CPRI is carrying out pollution mapping with reference to transmission systems in Eastern & Southern regions.

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

With the support of Ministry of Power, Government of India, valued customers from India & Overseas, Central & State Utilities and PSUs, CPRI has rendered 60 years of Quality Service to the Electrical Industry since its inception i.e. 1960.

(V.S. Nandakumar)
Director General

Contents

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Section- 1

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CENTRAL POWER RESEARCH INSTITUTE
बेंगलूर
BANGALORE
स्थापित 1960 ESTD 1960

Organisational Set - up

www cpri.in

Organisational Set - Up

CPRI - an overview

The Central Power Research Institute (CPRI) was established by the Government of India in 1960, both in Bengaluru & Bhopal, with its Headquarters in Bengaluru. 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 technical 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 there to 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 objectives.
- Maintain a research and reference Library.

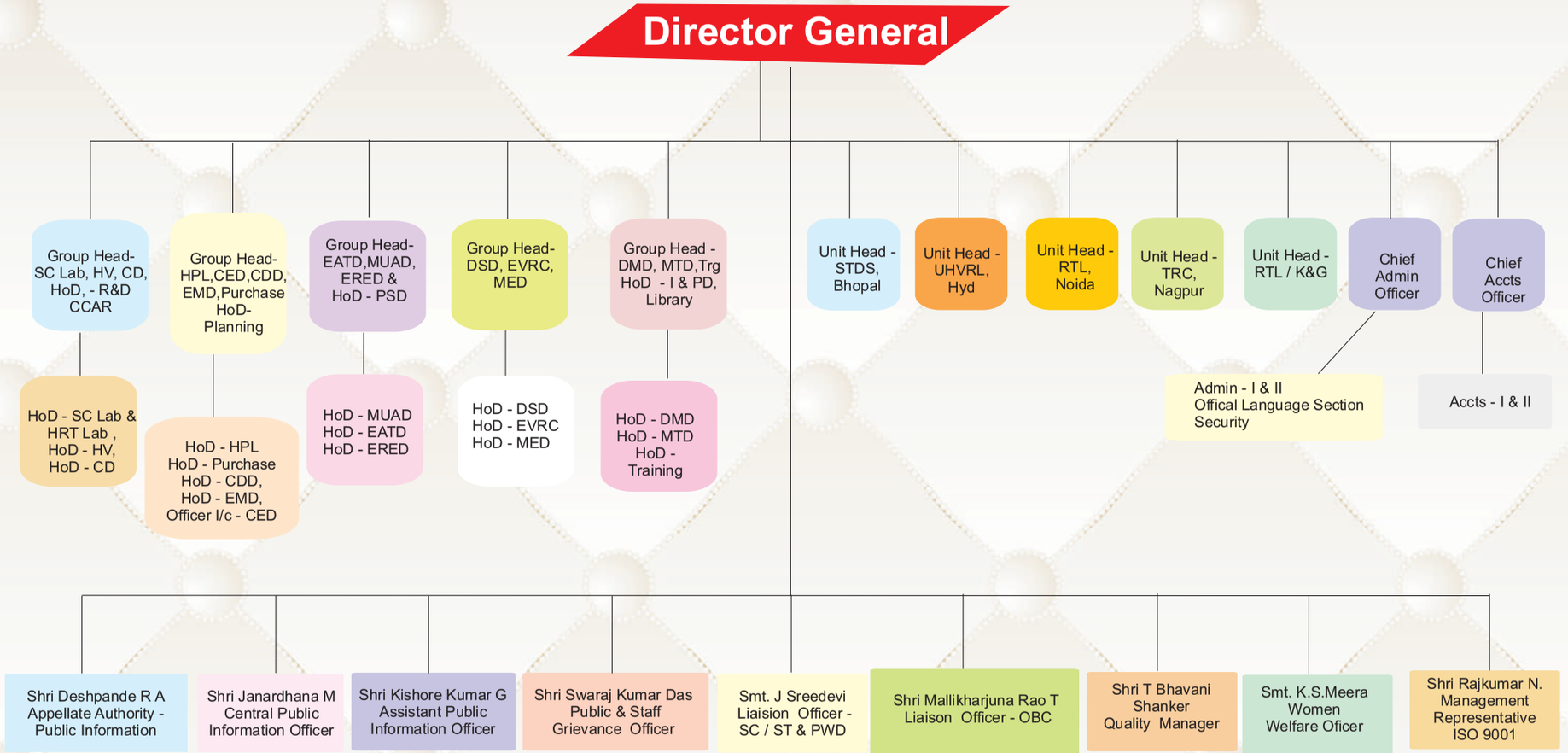
Management

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 2020



Central Power Research Institute, Bengaluru & Its Units

Central Research & Testing Laboratory (CRTL), Bengaluru

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 training programme initiatives
- 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

Power Cables Laboratory

This Laboratory offers consultancy on:

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

Carries out Research & Development on:

- ♦ Development of HV DC Cables and .
- ♦ 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

600kV, 4200 kVA Outdoor Transformer

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 Laboratory undertakes 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:

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

Partial Discharge test on 110 MW Turbo Generator

ELCID Test on Hydro Generator

Power Capacitors Laboratory

Power Capacitors Laboratory of CPRI, Bengaluru has established state-of-the-art facilities to cater to the test 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.

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, 150kvar, 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 undertakes 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. Switching transients associated with capacitors.
3. Investigation of PD Activity in Model Transformers.
4. Selection of appropriate type of Low Voltage capacitors for Low Voltage distribution system.
5. Review of Specification for High Voltage and Low Voltage capacitor banks
6. Root cause analysis of premature failure of capacitors

A view of Power Capacitors Laboratory

7. This Laboratory offers Consultancy and field engineering services for On-Line partial discharge measurement on power transformers in services.

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 & 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 in transformers. 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. and involved in R&D of polymeric insulators for electrical equipment. This division undertakes consultancy work and sponsored projects for different power utilities and manufacturing companies.
The Lubricating Oil Laboratory has been set up 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. 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 of low-voltage equipment like switches, bulbs, fans, heaters, refrigerators, air-conditioners, batteries etc.

Balanced Ambient Calorimeter

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, other generating stations, and Railways as per national and international standards. In addition, this centre offers consultancy services in checking the design adequacy of Structures/Substations for earthquakes.

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 Systems for carrying out vibration tests on products and assemblies.

Energy Efficiency & Renewable Energy Division (ERED)

This division undertakes 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 & 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 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.

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 for power equipment up to 2500 MVA, 72.5 kV, 3-Phase and 1400 MVA, 245 kV, Single Phase
- 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 (Static Meters, Pre-payment meters & Smart Meters) of voltage rating of 3 phase, 415V single phase 240V, with current rating of 200 Amps with an accuracy range from 0.2s to 2.0s (Active and Reactive modes) 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 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 works and sponsored projects for many power utilities and industries. Assistance has been rendered to BIS, in formulation of various standards on enamelled winding wires and insulating materials & systems.

Cyclic Corrosion Test Equipment

Weathering using Xenon Arc Lamp

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 from 1.0 micro ohms to 20 kilo ohms are conducted on LT Panels, Isolated Phase Bus Ducts and Isolators as per IS, IEC, ANSI and 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

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 offers Consultancy services for evolving optimized tower designs. In addition, this Division has laboratories to undertake R&D and to provide evaluation facilities for transmission towers, line components and accessories, vibration dampers, spacer / spacer dampers etc.

The Laboratories operating under this Division are:

- Prototype Tower Testing Station
- Structural Materials Testing Laboratory
- 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 Division 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.

- With PMUCAL Phasor Measurement Unit Testing & Calibration System 6135A, this Division undertakes Calibration and Testing of 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 and also performs 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.

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 are carried out 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 customized training modules for engineers from Power utilities and Electrical Industry.

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 12kV capacity utilizing two specially designed 1500 MVA

short circuit alternators, mainly caters to short circuit tests on high and Medium Voltage Switchgears, Transformers and other allied equipment.

STATION II:

The On-line Testing Station is drawing power up to 100 MVA from the MPSEB Grid from the Chambal Substation through 132 kV line. The fault level of 132 kV Bus at 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 the 1500 MVA short circuit alternator and Energy Meter Evaluation Laboratory.

Supplementary Test Laboratories:

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

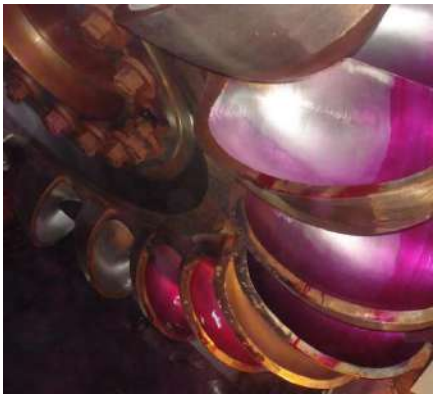
The Laboratory was set up with a view to cater to the testing, certification and evaluation needs of electrical power equipment manufacturing industry. This unit acts as a liaison unit of CPRI with various customers in Northern Region and coordinate their test requirements which are beyond the scope of the Regional Laboratory but within the capabilities of CPRI at Bengaluru 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 up to 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.

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

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:

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 is used 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

Outdoor ± 1200 kV / 200 mA DC test system has been commissioned 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.

A View of ± 1200 kV DC Test System

UHV Indoor Shielded Laboratory

UHV Research Laboratory has established new UHV Indoor Shielded Laboratory. The Laboratory is of dimensions 50 m (L) X 35 m (W) X 35 m (H) and is completely shielded from external interferences. The Laboratory has a 1200kV, 2A, AC Test System with partial discharge test facility for Instrument Transformers, Bushings and other high voltage equipment upto 800kV rating. In addition, the Laboratory is fully equipped with facilities for Capacitance and Dielectric Dissipation Factor Measurement, Radio Interference Voltage Measurement, Corona Test, Accuracy Tests, Temperature Rise Tests on Instrument Transformers, Dry and Wet Power-Frequency Voltage Withstand tests on high voltage equipment upto 800kV rating as per National and International standards.

Aerial view of UHV Shielded Laboratory

800kV RIP Transformer Bushing undergoing Partial Discharge test

Regional Testing Laboratory (RTL), Kolkata

This Laboratory was set up 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 co-ordinates the activities of transformer oil testing laboratory located at Guwahati, providing services to the North Eastern parts of India.

A view of Regional Testing Laboratory (RTL), Kolkata

Section- 2

Research & Development

RESEARCH & DEVELOPMENT

CPRI is the Coordinating Nodal Agency for Research Proposals received under the Research and Development schemes in India under Ministry of Power (MoP). CPRI has been entrusted with the responsibility of coordinating 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 are:
   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. 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 evaluate the technical feasibility. Based on the comments, the proposals are put up to a Technical Committee (TC) for recommendation. At present there are four TCs viz. TC on “Hydro”, TC on “Thermal”, TC on “Transmission” and TC on “Grid Distribution & Energy Conservation Research”. The TCs are chaired by eminent Professors from IITs. The proposals recommended by the TC are put up for consideration of D.G., CPRI/the Standing Committee on Research and Development (SCRD). The SCRD is chaired by the Chairperson, Central Electricity Authority, New Delhi and has representations from MoP, 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 and the remaining 25% by Industry.

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, Bengaluru. Further, the Four Technical Committees and the SCRD monitor the progress of the on-going projects.

During the 12th Five Year Plan and the subsequent three year action plan period, CPRI has funded 20 projects under the "R&D under NPP" scheme, 61 projects under RSoP scheme and 38 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 help in development of innovative solutions thereby adding to the knowledge capital on the particular priority area and also acts as prior art for the future researchers.

In-House Research Projects (IHRD)

In-house research projects 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 projects above Rs.50.00 Lakhs and by Director General, CPRI for projects with outlay upto Rs.50.00 Lakhs.

For the year 2019-20, following is the summary of the ongoing in-house research projects at CPRI:

Sl. No.	Project Title	Division	Outlay (Rs. in Lakhs)	Duration
1.	A Novel Optoelectronic Technique for Online Partial Discharge Monitoring of Transformers	Cables & Diagnostics Division, CPRI, Bengaluru	36.00	2 years
2.	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, Bengaluru	49.35	3 years

Sl. No.	Project Title	Division	Outlay (Rs. in Lakhs)	Duration
3.	Evaluation of the co-firing characteristics of Alternative Fuels mixed with high ash Indian coals for power generation applications	Materials Technology, Division CPRI, Bengaluru	33.00	2 years
4.	Development of LDPE, MDPE and HDPE Nano-composite for DC Cable Application	Cables & Diagnostics Division, CPRI, Bengaluru	105.00	2 years
5.	Study of AC Corona Phenomena and power loss for 1200 kV conductors and characterization of corona discharges from line / substation components	UHVRL, CPRI, Hyderabad	132.00	2 years
6.	Study of Electric Field Environment of HVDC Transmission Lines	UHVRL, CPRI, Hyderabad	114.00	3 years
7.	A study on online partial discharge measurement of power cables using inductive couplers and noise elimination by wavelet technique	Cables & Diagnostics Division, CPRI, Bengaluru	92.00	3 years
8.	Evaluation of re-ignition circuit by replacing the air gap with vacuum interrupter bottles	High Power Laboratory, CPRI, Bengaluru	105.00	2 years
9.	Development and demonstration of ultra-capacitors and lead-acid batteries based hybrid storage for a 5 kW solar- powered micro-grid	Capacitors Division, CPRI, Bengaluru	49.50	2 years
10.	Development of gasification reactor system for conversion of multi fuel to syngas	Materials Technology Division, CPRI, Bengaluru	91.00	2 years

Sl. No.	Project Title	Division	Outlay (Rs. in Lakhs)	Duration
11.	Development and demonstration of 1 kW soluble lead redox flow battery system for solar energy and retrieval	Electrical Appliances Technology Division, CPRI, Bengaluru	77.00	2 years
12.	Run-of-the-River low head micro hydroelectric system for off-grid microgrid operation	Materials Technology Division, CPRI, Bengaluru	93.50	2 years
13.	Smart Transmission through Wide Area Measurement System to control and co-ordinate HVDC/FACTS devices	Power Systems Division, CPRI, Bengaluru	110.00	2 years
14.	Improvement in Composite Polymeric Insulator Characteristics with Nano Filler Additives for Outdoor DC Applications	Insulation Division, CPRI, Bengaluru	48.47	1.5 years
15.	New Generation Ethylene Vinyl Acetate (EVA) nano-composites with high UV shielding properties for Photovoltaic Modules	Insulation Division, CPRI, Bengaluru	27.50	1.5 years
16.	Development of Polymeric Films for High Energy Density Capacitors Application	Dielectric Materials Division, CPRI, Bengaluru	94.60	1.5 years
17.	Computational design and Development of Green Insulating fluids for power transformers: Renewable non-edible oil	Dielectric Materials Division, CPRI, Bengaluru	27.28	1.5 years
18.	Development of test method for studies on pollution performance on composite insulators to be used on DC systems	UHVRL, CPRI, Hyderabad	164.00	1.5 years

Sl. No.	Project Title	Division	Outlay (Rs. in Lakhs)	Duration
19.	Development of vegetable ester based nano fluids for transformers	Dielectric Materials Division, CPRI, Bengaluru	40.70	1.5 years

For the year 2019-20, following is the summary of the completed 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, Bengaluru	46.80	2 years
2	A reliable optimal smart metering infrastructure for Smart Grid	Power Systems Division, CPRI, Bengaluru	70.00	2 years
3	A study on the effect of nanoparticles on the critical parameters of insulating fluids	Dielectric Materials Division, CPRI, Bengaluru	20.00	2 years
4	Development and Demonstration of an Adaptive Protection Scheme for Distribution Systems under High Penetration of Distributed Energy Resources	Power Systems Division, CPRI, Bengaluru	72.38	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 2019-2020, the following is the summary of the ongoing RSoP projects:

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration
1.	Development and AC Characterization of 2nd Generation High Temperature Superconductor (HTS) based Modular SFCL System	Inter-University Accelerator Centre, New Delhi	49.60	2 years
2.	Development of High temperature Low Sag Nano composite Core	SIT, Tumkur	28.00	2 years
3.	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
4.	Day Ahead Solar Power Forecasting for Indian Climatic Zone	Central Power Research Institute, Bengaluru	50.00	2 years
5.	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
6.	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
7.	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
8.	Adaptive protection schemes for microgrids with grid - connected and islanded mode of operation	Indian Institute of Technology, Roorkee	30.00	2 years
9.	Erosion-Corrosion Studies on Thermal Sprayed Conventional and Nanostructured Coatings	Indian Institute of Technology, Madras	68.00	2 years
10.	Performance improvement of steam generator through the enhanced hydrophobic surface	Indian Institute of Technology, Bhubaneswar	49.98	2 years
11.	High temperature erosion characteristics of boiler tube materials of sub-critical and supercritical thermal power plants	CPRI, Bengaluru	49.86	2 years

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration
	and prediction of critical erosion regions through CFD modelling			
12.	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
13.	Development of Blue Light Emitting Diode packages	M.S. University of Baroda, Vadodara	49.50	2 years
14.	IEC 61850 Compliant SF6 Monitoring System for Gas Insulated Switchgear	VSSUT, Burla	48.00	2 years
15.	Development of Nanocrystalline Materials for Solid Oxide Fuel Cells working at 600 degree C	KITS, Coimbatore	27.46	1.5 years
16.	Post Combustion Carbon Capture & Sequestration (CCS) Plant on a Coal Fired Thermal Power Plant – Feasibility Study	RKDF University, Bhopal	38.50	1.5 years
17.	Analysis of Performance of Inclined Plate Anchors Embedded in Geosynthetics Reinforced Soils for Transmission Tower Foundations	IISc, Bengaluru	31.96	1.5 years
18.	Investigations on Control Flexibilities of Grid Integrated Solar Photo Voltaic Energy Conversion System	NIT, Warangal	31.10	1.5 years
19.	Development of High-Power and High-Energy Density Solid-State Hybrid-Energy Storage Device	Pondicherry University, Puducherry	59.24	1.5 years
20.	High Capacitance (50F to 200F) Graphene Supercapacitors for Storage of Power from Renewable energy sources	CMET, Thrissur	71.28	1.5 years
21.	Design and Development of RF Sensors for Identification and Localization of Incipient Discharges in GIS	IITM, Chennai	38.40	1.5 years
22.	Design and Development of a Cost Effective & Energy-Efficient Grid-Connected Pumped Hydro System employed with Sensor-Less PMBLDCM	NIT, Meghalaya, Shillong	32.09	1.5 years

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration
23.	Model Order Reduction for Simulation Acceleration in Power Electronics	NIT, Srinagar	7.02	1.5 years
24.	Design, Development and Validation of a New Adaptive Digital Relaying Scheme for Power Transformer	IIT, Roorkee	47.73	1.5 years
25.	Bio-processing of Coal Industrial Effluent and Coal Fines Recovery using Aquatic Plants and Phototrophs	CIMFR-CSIR, Dhanbad	36.85	1.5 years
26.	Design and Development of 5m Long Single Phase HTS Cable	IIT, Kharagpur	51.21	1.5 years
27.	Modular Induction Stove Design for Indian Cookware	Indian Institute of Technology, Gandhinagar	12.79	0.5 years
28.	Development of Electricity Based Clean and Efficient Cooking Technology Suitable for Indian Cookware	Indian Institute of Technology, Kharagpur	36.21	1.5 years
29.	Design of Fault Tolerance and Reconfiguration Control for Megawatt Power Electronic Converters Fed Variable Speed Pumped Storage Unit	Indian Institute of Technology, Roorkee	48.25	1.5 years
30.	Design and development of tools for detection and prevention of cyber-attacks in smart grid Energy Management Systems (EMS)	Indian Institute of Technology, Bhubaneshwar	49.92	1.5 years
31.	Computational feasibility studies on the development of high temperature superconducting magnetic energy storage (SMES) systems	Lovely Professional University, Punjab	19.98	1.5 years
32.	Transmission Line Protection in the Presence of Bulk Solar Photo Voltaic Power Plants	Indian Institute of Technology, Kharagpur	48.40	1.5 years
33.	Thermoelectric Power Generator for Clean Energy Generation by Recycling Waste Heat Generated in Power Plant	IIT, Kanpur	50.00	1.5 years
34.	The unsteady aerodynamic response in LP turbine blade and its control under part load conditions	Indian Institute of Technology, Roorkee	38.64	1.5 years

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration
35.	Development of plasma torch for efficient disposal of municipal solid waste	CSIR-Central Mechanical Engineering Research Institute, Durgapur	21.67	1.5 years
36.	Design, operation, and control of distributed generation (DG) integrated unified power quality conditioner (UPQC) in electric grid	Indian Institute of Technology, Guwahati	32.30	1.5 years
37.	Design, Implementation and Analysis of Wireless Power Transfer and PV System for Battery Charging of Passenger e-Bus	National Institute of Technology, Trichy	32.40	1.5 years
38.	Design and Development of Improved Control Techniques for Unified Power Quality Conditioner with Distributed Generation (UPQC-DG)	Birla Institute of Technology and Science, Pilani	21.10	1.5 years
39.	Design and Development of Efficient Induction Cooker suitable for Vessels of Different Material	National Institute of Technology, Warangal	14.30	1.5 years
40.	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
41.	High performance PFC based LED Drivers working under Stringent AC Supply	Government Engineering College, Bikaner	34.76	2 years

The following is the summary of the completed RSoP projects:

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration
1	Inferring the dielectric and partial discharge characteristics of nano fluids for power transformer applications	Sona College of Technology, Salem	17.00	2 years
2	Development of intelligent relaying scheme for microgrids with DG penetration	Indian Institute of Technology, Bhubaneswar	28.00	2 years
3	Design, development and deployment of grid interfaced power conversion unit for solar -wind power generation system	Arunai Engineering College, Tiruvannamalai	3.45	2 years
4	Development of solid state transformer as a wind power interfacing device	National Institute of Technology, Calicut	28.00	2 years
5	Characterization of Electric Double Layer Super Capacitor with CNT-conducting Polymers / Metal Oxide Composites and Nano Dielectrics	R.V. College of Engineering, Bengaluru	16.00	2 years
6	Hybrid HVDC Systems for Multi Infeed Applications	M.S. Ramaiah Institute of Technology, Bengaluru	17.00	2 years
7	Development of a dsPIC based efficient system for simultaneous active power sharing and reactive power compensation in a grid-connected photovoltaic system	Mizoram University, Aizawl	7.10	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 2019-2020, the following is the summary of the ongoing NPP projects:

Sl. No.	Project Title	Organization	Outlay (Rs. in Lakhs)	Duration (years)
1.	Development of a Selection Methodology for Road header and Tunnel Boring Machine in Different Geological Conditions for Rapid Tunneling	CSIR-Central Institute of Mining & Fuel Research & Indian Institute of Technology (Indian School of Mines), Dhanbad	289.20	2 years
2.	Development of polymer nano-composites for EHVDC Lines and diagnostics adopting laser induced breakdown spectroscopy (LIBS)	IIT, Madras	268.41	2 years
3.	Study of photo biological safety of LED lamps and luminaire	CPRI, Bengaluru	400.00	2 years
4.	Investigation on flow instabilities in draft tube at off-design operation of hydraulic turbines	IIT, Roorkee	175.00	2 years
5.	Establishing Novel Erosive Wear Test Facility for Testing of Materials Used in Hydroturbine Components	IIT, Madras	125.00	2 years
6.	Development of intumescent fire retardant nano-composites for medium voltage cable sheathing applications	The Energy and Resources Institute, Bengaluru	134.00	2 years
7.	Low cost silicon rubber insulator	Raychem RPG Pvt. Ltd., Vadodara	141.90	2 years

The following is the summary of the completed NPP projects:

Sl. No.	Project Title	Organization	Outlay (Rs. In Lakhs)	Duration
1.	Power Conversion, Control and Protection Technologies for Micro-Grid	Indian Institute of Science, Bengaluru	336.00	2 years

Ongoing UAY Projects under National Perspective Plan (NPP) Schemes

Sl. No.	Title of Project	Organization	Total Sanctioned Cost (Rs. In Lakhs)
1	Development of a high efficiency, high pressure ratio 'Micro Steam Power Pump Block' of 100 kW capacity	IISc., Bengaluru	208.00

Ongoing IMPRINT Projects under National Perspective Plan (NPP) Schemes

Sl. No.	Title of Project	Organization	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

Sl. No.	Title of Project	Organization	Total Sanctioned Cost (Rs. In Lakhs)
7	Design, Development and Control of High-Speed Switched Reluctance Generator for Direct-Coupled Operation with Thermal Turbo-Machinery	Indian Institute of Science, Bengaluru	395.00
8	Development and Application of Small Scale Bending Tests for Residual Property Assessment of High Temperature Materials in Turbines	Indian Institute of Science, Bengaluru	221.52

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

Dielectric Materials Division

Sl. No.	Title	Sponsoring Organisation	Duration	Outlay (Rs. in lakhs)
1.	Conducting polymer based electrode materials for super capacitors	Sponsored Project (DST)	3 years (April 2017 to April 2020)	21.06
2.	A Management service for the treatment of transformer mineral oil containing PCBs using the mobile PCB de-chlorination system in India	UNIDO	September 2016 to December 2020	500.00

Energy Efficiency & Renewable Energy Division

Sl. No.	Title	Sponsoring Organization	Duration (Start & Close)	Outlay (Rs.in lakhs)
1.	Establishment of LED luminary test facility across various locations of India	BEE	January 2018 to January 2021	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	December 2015 to June.2020	36.00

Materials Technology Division

Sl. No.	Title	Sponsoring Organisation	Duration (Start & Close)	Outlay (Rs. In lakhs)
1.	Development of Micro-Hydel Power Generation by Local Water Streams for Drying Cardamom, Ginger, Mushroom and other Herbs and Vegetables at Sikkim	M/s. Sikkim State Council of Science & Technology (SSCS&T), Gangtok, East Sikkim	July 2016 to June 2019	20.20

Information on Patents

The patents filed during the year:

Sl. No.	Patent Title	Patent Application No.	Date of Filing	Inventors Name
1.	Simulated particle impact Erosion system for Grading Thermal Power Plant tube materials and coatings".	201941018786	1st April 2019	Dr. R.K.Kumar Dr.V.Saravanan Shri. M.Janardhana CPRI Dr. GSVL Narasimham, IISc., Bengaluru

Patents awarded during 2019 - 20:

Sl.No.	Patent Title	Patent Application No.	Year of Award	Inventors Name
1.	A novel method for synthesis of dawsonite from fly ash	315960	July 2019	Dr.M.Shekhar Kumar K.Surynarayanana Dr.S.Seetharamu
2.	Fly ash Cenosphere composites for sanitation applications	324627	November 2019	Dr.M.Shekhar Kumar T.R.Venkatesh Dr.S.Seetharamu
3.	Pulverised coal ash based granules through low energy route for filler applications	328643	December 2019	M.G.Ananda Kumar Dr.M.Shekhar Kumar Dr.S.Seetharamu
4.	An improved water/nitrogen dual cooled probe system for collecting burnt sample particles at various elevations inside drop tube furnace	330014	January 2020	Dr. V.Saravanan Dr. R.K.Kumar Dr. S. Seetharamu
5.	Intelligent Air Conditioner Controller	331767	February 2020	M Siddhartha Bhatt

Section- 3

Evaluation & Certification

EVALUATION & CERTIFICATION

For the past six decades, the Institute has been serving the power sector in the field of evaluation and certification. CPRI is a Member of Short Circuit Testing Liaison (STL) and the Laboratories are accredited by NABL as per IEC/ISO 17025:2017, ISO 9001:2015, BIS. During the year 2019-20, a total of 93,200 evaluations were conducted on 22,694 samples for 4,369 organizations which includes Central, State & Private Power Utilities, domestic and international electrical equipment manufacturers.

First –time Tests

Capacitors Division

HV SHUNT CAPACITORS

- Testing and evaluation of HV Shunt capacitors of various ratings ranging from 121kvar,6.99kV to 600kvar,10.96kV from various organizations as per national and international standards and industry protocols.

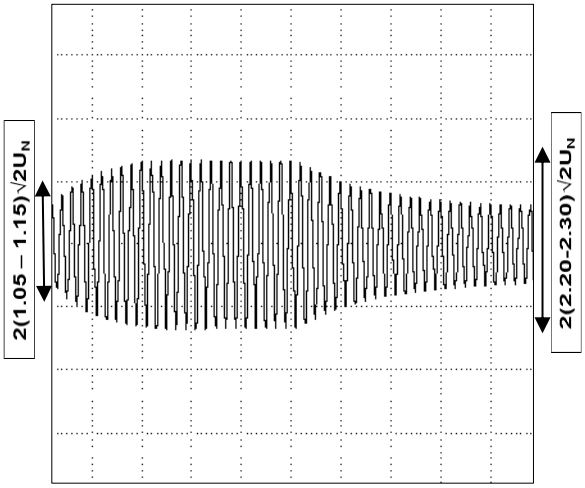
  Testing and evaluation of 600kvar, 10.96kV Internal fuse HT Shunt capacitor was the highest voltage rating tested as per IEC 60871-1-2014, in Capacitors Division during 2019-20.

	
Arrangement for Thermal Stability Test on 600kVar 10.96kV, Internal Fuse capacitor unit	**Test arrangement for Lightning Impulse voltage test 600kvar 10.96kV, Internal Fuse capacitor unit**

OVER VOLTAGE TEST AT -30°C

- Testing and evaluation of HV Shunt capacitor of rating 105kvar, 3.743kV, Internal fuse type manufactured in India, as per IEC 60871-1-2014, for Over Voltage test at minus 30°C for the first time in Capacitors Division.

Photographs of the test sample and typical oscillogram of the over voltage cycle are shown below:

	
Arrangement for Over Voltage Test on 105kvar, 3.743kV, Internal fuse HV capacitor	**Typical Oscillogram of Over Voltage cycle captured during Over Voltage Test at (minus 30°C) on 105kvar, 3.743kV, Internal fuse HV capacitor**

LOW VOLTAGE CAPACITORS

All routine and type tests as per IS 13340: 2012, IS 13585: 2012 and as per IS 2993: 1998 on LV shunt power capacitor and AC motor capacitors were carried out. The rating of LV shunt capacitors are from 1 kvar to 66.2 kvar. AC motor capacitors were in the range from 6 µF to 25 µF.

	
Ageing test on 66.2kvar,525V,3 Phase, Non-Self Healing type LV shunt capacitor tested in the year 2019	**Some of the AC Motor capacitors tested in the year 2019**

- **TEST OF CAPACITANCE AT TEMPERATURE OF -25ºC to +45ºC AT VARIOUS FREQUENCIES OF 30 kHz to 500 kHz. FOR CAPACITOR MODULE OF CAPACITOR VOLTAGE TRANSFORMER (CVT)**

  Evaluation of 170 kV, 4400pF capacitor sample for High Frequency Capacitance and Equivalent Series Resistance tests as per the latest IEC 60358-2:2013 and customer's request for evaluation at a temperature range from -25ºC to +45ºC in the frequencies of 30 kHz to 500 kHz was carried out for the first time at the capacitor laboratory. This Capacitor module is part of a CVT.

  A view of the test sample is as shown below:

A view of the 170 kV, 4400pF capacitor module of CVT

Cables & Diagnostics Division

- Extension Pre-Qualification test on 127/220 kV XLPE Cable with accessories for a duration of 3 months has been successfully conducted for the first time in India.

Extension Pre-Qualification test on 127/220 kV XLPE Cable with accessories

Pre-Qualification test on 127/220 kV XLPE Cable with accessories

- Pre-Qualification tests on 1X 2000 sq.mm Copper conductor, XLPE insulated 127/220 kV cable system and 1X 1200 sq.mm Copper conductor, XLPE insulated 127/220 kV cable system carried out for the first time in India.

Cable in tunnel with snaking arrangement

Cable laid through HDPE Pipe

Cable outdoor terminations connected for heating cycle voltage test

- Type tests on 185 Sq.mm Palm type Tinned Copper Tubular Cable Terminal lugs have been completed successfully for the first time in India.

Fig 1: Test Set up for Heating Cycle Test

Fig 2: Terminal Lug

Electrical Appliances Technology Division (EATD)

- Performance tests such as high voltage isolation check, internal resistance test and self-discharge test carried out for the first time on repurposed Lithium ion cells/ battery pack (13.8 V – (18 Ah & 22 Ah) for M/s. Imbuo Explorations Pvt. Ltd., Bengaluru in accordance to UL 1974.
- Life cycle testing as per customer's requirement carried out for the first time on 2.3 V – 30 Ah Lithium ion cell for M/s. Log9 Materials Scientific Pvt. Ltd., Bengaluru.

Energy Efficiency & Renewable Energy Division (ERED)

- This is a new type of testing carried out for the first time in India: Safety testing as per IS 16221-1/ IEC 62109-1 and IS 16221-2 / IEC 62109-2 standards carried out on Solar water pumping controller of 4800 W capacity manufactured by M/s. Shakti Pump Ltd., Pune.

- Testing of 1.25 MVA inverter of M/s. BHEL, Bengaluru as per CEA guidelines (Technical standard for Grid connectivity, 2019) for Low Voltage Ride Though, Frequency Ride Through and High Voltage Ride Through. This is India's first test of Low voltage ride-through, frequency ride-through and high voltage ride-through as per CEA guidelines for a capacity of 350 kW. The facility has capacity to test up to 540 kVA (AC) & 1000 V, 1800 A, 750 kW (DC).

Testing of Inverter for Low Voltage Ride Though, Frequency Ride Through and High Voltage Ride Through

High Power Laboratory

- As per the contract, High Power Laboratory has offered Testing consultancy service to M/s. National High Power Testing Laboratory Pvt. Ltd., Bina for supervision and conducting short circuit proof test on 500MVA, 400/220/33kV, Three phase Auto transformer using 400kV National Grid, from 12th March to 16th March 2020. This is the highest Auto-transformer MVA rating tested first time in India.

Short circuit proof test on 500MVA, 400/220/33Kv. Three phase Auto transformer

Mechanical Engineering Division (MED)

400 kV S/C "Y" shaped steel monopole was tested successfully for the first time in the country, for M/s. Valmont Structures Ltd., Pune.

Testing of 400 kV S/C "Y" shaped steel monopole

Ultra High Voltage Research Laboratory (UHVRL), CPRI, Hyderabad

- Power Frequency Voltage Withstand test on 400 kV, 4000 A, 63 kA GIS was carried out using two AC sources for the first time for M/s. GE T & D India Ltd., Chennai.

Power Frequency Voltage Withstand test on 400 kV, 4000 A, 63 kA GIS

New Test Facilities Created

Dielectric Materials Division (DMD)

- Inductively Coupled Plasma - Optical Emission Spectrometry (ICP-OES) is a technique in which the trace composition of inorganic elements can be determined using plasma and a spectrometer. Using this instrument we can analyse lead content in Household and Decorative Paints as per ASTM E 1613 and ASTM E 1645. Ministry of Environment, Forests & Climate Change (MoEFCC) has authorized CPRI as third party testing laboratory to analyze Lead content in paints.

- Thermal Constant Analyser, measures thermal conductivity (0.01 to 500 W/mK) of various samples such as polymers, bricks, oil samples & powder at various temperatures from -20°C to 150°C as per IS0-22007-2 (Hot Disc Method).

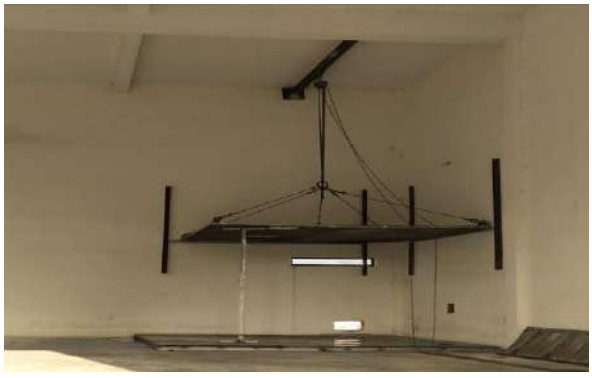
Energy Efficiency & Renewable Energy Division (ERED)

- State-of-the-art and unique first facility in India for the assessment of the Photobiological safety of luminaires and lamp systems (especially LED systems) with the IDR300-PSL system according to various international and national standards viz. IEC/EN 62471,IS 16108,IEC /EN 60598-1,IEC TR 62778 & IEC 62471-5 established at ERED, CPRI, Bengaluru.

Test facility for assessment of the Photobiological safety of luminaires and lamp systems

High Power Laboratory (HPL)

- New indoor internal arc test cell with adjustable roof has been set up in HPL, CPRI, Bengaluru



New indoor internal arc test cell

Mechanical Engineering Division (MED)

- Facility for Vibration/Fatigue test for Six/Eight (bundle) conductors has been set up for various configuration of Insulator strings with hardware assembly at Wake Simulation Laboratory of MED, CPRI, Bengaluru.

Materials Technology Division (MTD)

- Advanced Scanning Electron Microscope with EDX facility was established for characterization of different materials (metals, ceramics, polymer, composites, coatings etc.)

Advanced Scanning Electron Microscope with EDX facility

Regional Testing Laboratory (RTL), CPRI, Noida

- RTL-CPRI, Noida has added the new facility for Water Penetration Test and Ampacity Test for medium voltage covered conductors as per EN 50397-1: 2006.

- RTL-CPRI, Noida has added new facility for carrying out IP TEST as per IS/IEC: 61439.

IP TEST facility as per IS/IEC: 61439

200kV, 1A Continuous duty High Voltage source for conducting Accuracy and temperature rise test on Voltage Transformer (VT / PT) up to 220 kV/√3 Class as per IS 16227 (Part 3) and IEC 61869-3.

200kV, 1A High Voltage Source

- 110 V and 110 V/√3 rated Voltage Transformer (VT / PT) Burden for conducting Accuracy test on three phase Voltage Transformer as per IS 16227 (Part 3) and IEC 61869-3.

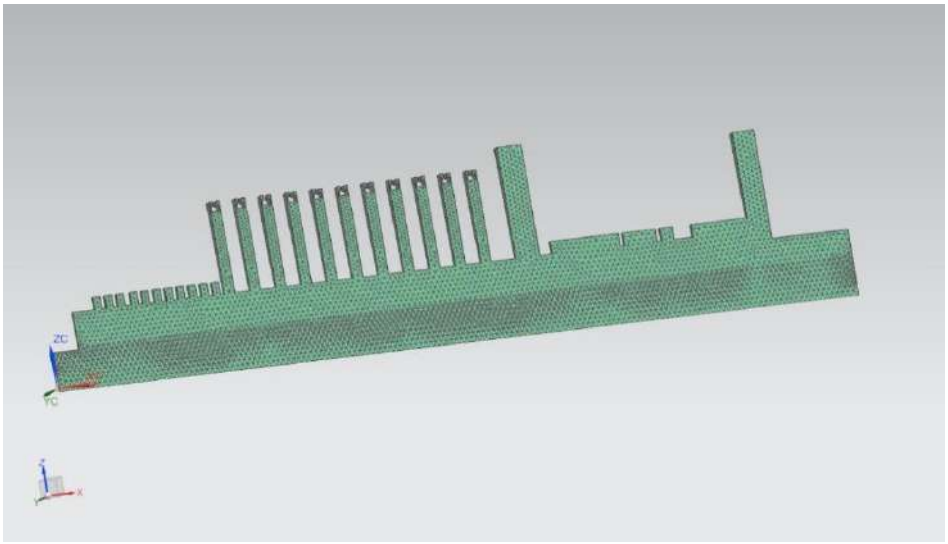
Voltage Transformer (VT / PT) Burden

Thermal Research Centre (TRC), CPRI, Koradi

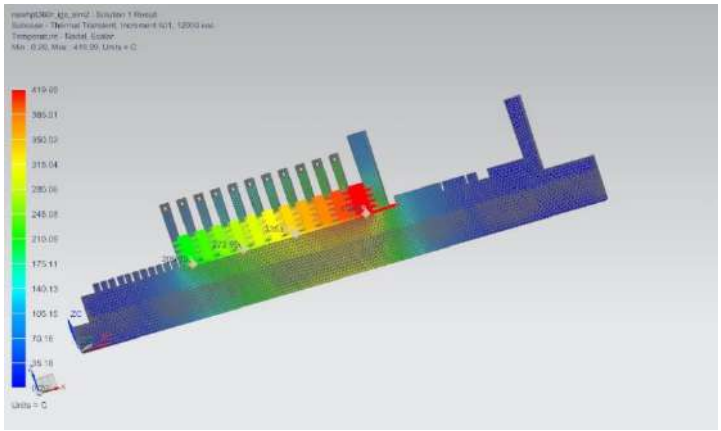
- **Finite Element Software**

The Finite Element Analysis (FEA) is the simulation of any given physical phenomenon using the numerical technique called Finite Element Method (FEM). Engineers use it to reduce the number of physical prototypes and experiments and optimize components in their design phase to develop better products, faster.

NX Nastran FEA software is available at CPRI, Nagpur. Transient thermal stress and strain in case of a steam turbine rotor have been evaluated by this software. Subsequently low cycle fatigue damage is also assessed.



Meshed Model of HP Turbine Rotor

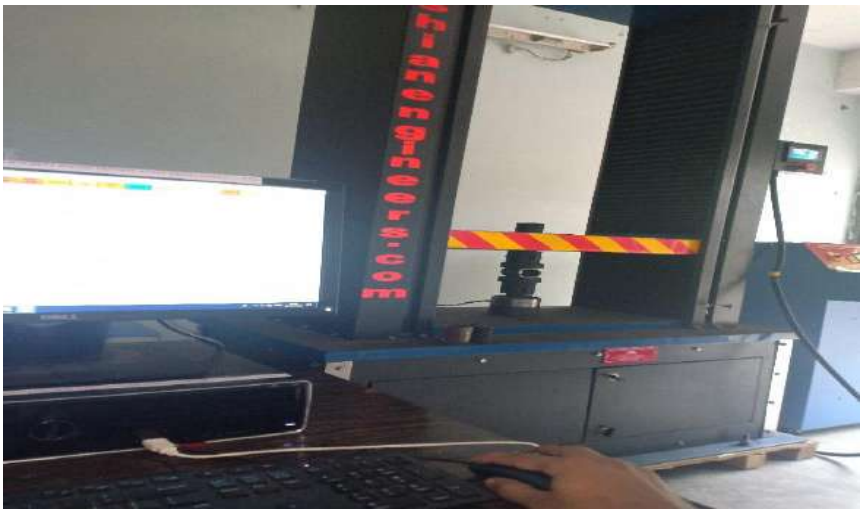


Gradual decrease in temperature values along the stages in 12000 sec time step

Finite Element Software facility at CPRI, Nagpur

- ## Computer Controlled Universal Testing Machine

A Computer Controlled Universal Testing Machine has been installed to test the tensile and compressive strength of materials.



Computer Controlled Universal Testing Machine

- **Bench Spectrometer-Metavision-1008i,** a high precision Optical Emission Spectrometer (OES) for elemental analysis of solid metals is recently installed. The instrument is capable of giving analytical results used for certification of products and other application demanding rapid analytical results.

Bench Spectrometer-Metavision-1008i

Special Tests Conducted

Capacitors Division (CD)

- **Thermal Stability Test on HV Dry Type DC Capacitor**

Thermal stability test on 10.8 kV, 9.45 µF, 1.5A, Dry DC Capacitor was conducted for a Swedish customer as per international standards such as IEC/IEEE and as per customer's requirement.

A view of the test arrangement is as shown below:

Test set used for energizing test capacitor with HVDC superimposed with HVAC current

- **Destruction Test on High Voltage and High Capacitance Dry Type DC Capacitor**

Destruction test was carried out on 2.8 kV, 9100 µF, Dry DC Capacitor for a Swedish customer as per IEC 61071 and as per the customer's requirement which was the largest rating of capacitor ever tested in the laboratory.

A view of the test capacitor undergoing destruction test is as shown below:

A view of the test capacitor on completion of the destruction test

ENVIRONMENTAL TESTS

- **Environmental Test on Acoustic Steam Leak Detection System**

Environmental testing of the BHELSONIC- Acoustic steam leak detection system comprising of the BHELSONIC system panel and the field amplifier was carried out for M/s. BHEL. A view of this panel is as shown below:

Test arrangements for the testing of the BHELSONIC-Acoustic steam detection system

- Testing of BHELFEED Gravimetric feeder panel comprising of the BHELFEED remote control panel and BHELFEED local control panel was carried out for M/s BHEL. A view of this panel is as shown below:

Test arrangements for the testing of the BHELFEED-RCP & LCP

Electrical Appliances Technology Division (EATD)

- Charge efficiency test was carried out on sealed nickel cadmium single cells (MFNL-185P) for M/s. Saft India Pvt. Ltd., Bengaluru. In this test, the cells were charged at 0.1C rate for different charge durations followed by test discharge at 0.2C rate.

Energy Efficiency & Renewable Energy Division (ERED)

- Testing of Power-temperature de-rating characteristics on solar grid tied inverter of 60 kW capacity was tested for M/s. Ginlong (Ningbo) Technologies Co. Ltd, China.
- Safety testing as per IS 16221-1/ IEC 62109-1 and IS 16221-2 / IEC 62109-2 standards were completed on Solar grid connected string inverter of 27.6 kW capacity manufactured by M/s Solar Edge Technologies Pvt. Ltd., Israel.

Earthquake Engineering & Vibration Research Centre (EVRC)

- Seismic qualification test on 145 kV, 3150 A, 3 Pole, SF6 Circuit breaker & 245 kV, 3150 A Vertical Break Disconnector for M/s. ABB India Limited, Vadodara.
- Vibration testing of Coal feeder panel used in thermal power plant for M/s. Bharat Heavy Electricals Limited, Tiruchirapalli.
- Vibration and shock test on Railways applications - Rolling stock equipment: Dry Type Transformer, Inductor, Driver display unit, Fire alarm unit, Pantograph etc.

High Power Laboratory (HPL)

- Internal Arc test on 220kV CT for M/s. Mehru Electrical and mechanical Engineers Pvt. Ltd., Bhiwadi.
- Short time current test on 1000V, 1600A Sandwich busway for M/s. Elins switchboard Pvt. Ltd., Bengaluru.

Short time current test on 1000V, 1600A Sandwich busway

- Power Arc test on 25kV composite insulator for M/s BHEL, Bengaluru.

Power Arc test on 25kV composite insulator

- Short time current test on Earthing Clamp for M/s. Sicame India Connectors Pvt. Ltd., Kancheepuram.
- Ability to withstand the dynamic effects of short circuit test on 100 MVA, 400/11.5-11.5kV three phase transformer for M/s. BHEL, Bhopal.

Ability to withstand the dynamic effects of short circuit test on 100 MVA, 400/11.5-11.5kV three phase transformer

- Short time current test on Burndy fired wedge connectors for panther conductors for M/s. Hubbel India Electrical Products LLP, Chennai.

Short time current test on Burndy fired wedge connectors for panther conductors

Materials Technology Division (MTD)

Non-destructive test for detection of magnetite deposits in stainless steel tube bends of steam generating stations

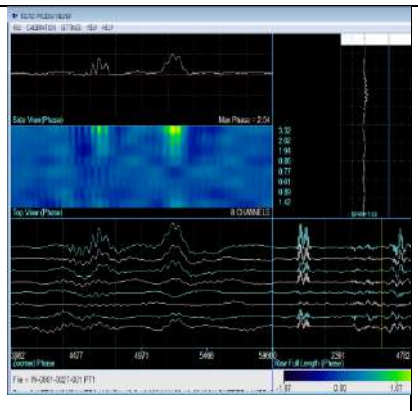
- Materials Technology Division of CPRI conducted magnetite inspection in 500MW power plant boiler of super heater tube with type 304 stainless steel, using advanced Non-destructive testing method called Low Frequency Electromagnetic Technique (LFET) in India. The utility experienced problems with magnetite deposit in bottom of super heater tube bends (Fig.2). The super heater section consisted of 101 assemblies (Fig.1) with 32 vertical runs per assembly. Altogether, 25 assemblies (800 tubes) were inspected. Tube data: Material-UNS S34709, 65mm OD x5.5mm Thickness.

Figure 1:Super heater tube bends

Figure.2: Detection of Magnetite at tube bends

- Out of 800 tubes evaluated, 63 tubes showed the signs of magnetite deposits, 13 tubes a moderate signal change. The most of the signal corresponded to the largest amount of removed magnetite deposits as shown in fig.3.

(a) Magnetite choked tube



(b) Corresponding waveform

(C) Extraction of magnetite

Figure 3 : Waveform showing significant signs of deposited magnetite and extraction

The inspected tubes were cut open and the magnetite deposits were removed and the tubes were then welded back into panel for service. In this way, a marked reduction in the manpower and time required for maintenance could be realized. The utility has found that LFET inspection is an effective tool to manage the magnetite deposit issues at tube bends.

Short Circuit Laboratory (SCL)

- Short-time current test on Ground Clamps at 16kA rms for 9 seconds was carried out as per UL Standard on 2nd December 2019.

Short-time current test on Ground Clamps

Switchgear Testing & Development Station (STDS), CPRI, Bhopal

- Short time withstand current test on 36kV, 24000A, 150kA isolated phase busduct with CTs for M/s. C&S Electric, Greater Noida on 13th June 2019.

- Arc fault test on 415V, 2000Amps, PCC/MCC Panel for M/s. BCH Electric Ltd, Faridabad, on 17th August 2019.

- Ability to withstand the dynamic effects of short circuit test on 12500kVA, 33/ (4x 0.600)kV, Inverter Duty Power Transformer for M/s. Voltamp Transformers Limited, Vadodara, on 28th August 2019.

- Ability to withstand the dynamic effects of short circuit test on 40/50MVA, 132/33kV Power Transformer, for M/s. ECE Industries Ltd., Sonepat, on 25th September 2019.

- High and Low Current short circuit test on 72kV, 10kA, 40kA station class lightning arrester (surge arrester) for M/s. Engineers Enterprise, Jaipur, on 7th February 2020.

Thermal Research Centre (TRC), CPRI, Koradi

- Work of MPI, Hardness testing, Material composition in-situ oxide scale measurement & Fibroscopic inspection of tubes, bend & header of Unit No. 8 & 9, 660 MW boiler at KTPS, Koradi.
- Insitu replication for detailed microstructure study of Sec. S/H tube bends of Unit no.9, 660 MW boiler at KTPS, Koradi

- Joint inspection & Fibroscopic test of W/W header & tubes at of Unit No.8, 660 MW boiler at KTPS, Koradi.

  The outcome of testing reveals the high temperature affected areas and as per suggestion tubes were replaced with new tubes along with thermocouples & Blocked tube of headers was identified & removed which benefited the plant to minimize the forced outages which was occurring frequently.

- Root Cause analysis of IP Turbine Control Valve of Unit No.2 (660MW) carried out at Prayagraj Power Generation Co. Ltd., Allahabad, U.P. The IP Control Valve of RHS, Unit No.2 (660MW) suddenly failed during running condition. All flange bolts got sheared off and the turbine which was running at 490 MW got tripped on high vibration.

  TRC, CPRI, Nagpur carried out the root cause analysis of this peculiar and rare type of failure and submitted detail report with recommendation to the plant. The suggestion given by TRC, CPRI, Nagpur helped plant to take corrective action.

- Metallurgical analysis of secondary Super Heater Coils & Re-heater Coils to minimize the oxidation and failures. The analysis was carried out at M/s. Jai Prakash Power Ventures Power Ltd., JNSPPP, Singrauli, and 2 x 660MW Boiler. The analysis was carried out considering various aspects. The recommendations provided to plants has minimized oxidations & failures in these areas. The plant outages was drastically controlled, which has helped in improvement of efficiency.

Ultra High Voltage Research Laboratory (UHVRL), CPRI, Hyderabad

- Measurement of electric and Magnetic field strengths under 765 kV, S/C Koradi-Akola transmission line circuit- II for M/s. Maharastra Eastern Grid Power Transmission Company Ltd., Gondia, on 24th February 2020.

Overseas Third party inspection service as STL Member:

High Power Laboratory

- Third party inspection of 90 MVA, 132/33 kV transformer at M/s. MTM, Malaysia, from 17th to 30th October 2019.

- Third party inspection of 90 MVA, 132/33 kV transformer at M/s. MTM, Malaysia, from 6th to 20th December 2019.

Testing & Certification for Overseas Customers

Capacitors Division

- Routine and Destruction tests on 40kVAR, 525V, MPP Capacitor as per IEC 60831-1&2: 2014 for M/s. Electrical Components Sdn. Bhd, Malaysia

Cables & Diagnostics Division

- Fire Resistance Circuit Integrity test on 300/500 V Cables for M/s. Supersign Industries (Electrical) Ltd., Bangladesh.
- Type test 11kV, 22kV & 33kV Cable Accessories as per IEC 60502-4 for M/s. REPL (Malaysia) SDN, BHD, Malaysia.
- Dielectric Dissipation Factor measurement on 36kV Resin Cast Current Transformer for M/s. Oman Cables Industry (SAOG), Sultanate of Oman.
- Fire Resistance Circuit Integrity test and Fire & smoke tests on 500V Instrumentation Cables for M/s. Permanoid Limited, Manchester, U.K.
- Toxicity test on Phenolic Fiberglass Panel for M/s. Milwaukee Composites Inc, Cudahy, United States.
- Smoke test on LSF Compound PVC Conduit & Accessories Material for M/s. Kingston Holdings FZC, UAE.
- Fire Resistance Circuit Integrity test on 300/500 V Cables for M/s. Asharqiyah cables company for industry, Saudi Arabia.
- Type test on 11 kV XLPE Cable as per IEC 60502-2 & Type test on LV Cable as per IEC 60502-1 for M/s.Qatar International Cables Company, Doha, Qatar.
- Type tests on LV & HV Cables as per IEC 60502-1 & IEC 60502-2 for M/s. Egytech Cables Elsewedy Electric.
- Type tests on V Cables as per IEC 60502-2 for M/s. Liban Cables, Lebanon.
- Fire Resistance Circuit Integrity test on 300/500 V Cables for M/s. Armana Group, Bangladesh.
- Type testing of Cables for M/s. Meghna Star Cables & Electrical Appliances Ltd., Bangladesh and M/s. Partex Cables Limited, Bangladesh.
- Type testing of XLPE Cables as per IEC 60502-2 -2014 for M/s. BBS Cables, Bangladesh.

- Fire Resistance Test (Fire Alone Test) as per IEC 60331, Oxygen Index Test as per ASTM D 2863, Smoke Density test as per ASTM D 2843, Halogen Acid test as per IEC 60754-1 & Oil Immersion Test on Cables for M/s. ECS Global Wire & Cable, Qatar.

- Capacitance & Tan Delta Measurement on 36 kV Dry Type Current Transformer for M/s. Esitas Instrument Transformers, Indonesia.

- Tracking & Erosion test, Volume Resistivity & Surface Resistivity tests on RTV Silicone High Voltage Insulator Coating for M/s. CSL Silicones Inc., Guelph.

Dielectric Materials Division

- Breakdown voltage test on 200kVA, 11/0.415kV & 250kVA, 11/0.415kV Three Phase Distribution Transformers for M/s. JRC Powertech, Bangladesh

Electrical Appliances Technology Division (EATD)

- Fan testing Laboratory of EATD, CPRI, Bengaluru carried out testing of AC Electric Ceiling Fan in accordance to IS 374:1979 manufactured by M/s. Supersign Electronics Industries Ltd., Bangladesh from 09 April 2019 to 22 April 2019.

- Battery Testing Laboratory of EATD, CPRI, Bengaluru carried out testing of Vented Nickel Cadmium Cells manufactured by M/s. Saft America Inc., USA in accordance to IEC 60627:2017.

- IP54 test as per IEC 60529 on 36 kV Dry Type Current Transformer for M/s. Esitas Instrument Transformers, Indonesia

Energy Efficiency & Renewable Energy Division (ERED)

- Testing of safety and protection of solar grid tied inverter of 27.6 kW capacity was tested for M/s. Solar Edge, Israel.

- Testing of 1.5 kW grid tied solar micro inverter which is single phase utility interactive type for Anti-Islanding test as per IS 16169:2014 / IEC-62116: 2008 standard for M/s. Hoymiles Converter Technology Co. Ltd., China

- Anti-islanding protection testing as per IS 16169:2014/ IEC 62116:2008 standard for Solar grid connected micro string inverter of 1500 W capacity for M/s. Hoymiles Converter Technology Co. Ltd., China.

Earthquake Engineering & Vibration Research Centre (EVRC)

- Seismic qualification tests on 420 kV, 3000A & 800 kV, 2000A Resin Impregnated Paper transformer bushing for M/s. Massa LLC (Izolyator Company), Moscow, Russia.

- Seismic qualification tests on 415 V, 200 A Electrical Power Distribution Panel for M/s. Phoenix Mecano S.E. Asia Pte Ltd., Singapore

- Seismic qualification tests on 12kV Switchgear unit M/s. AL – AHLEIA Switchgear Co. K.S.C.C., Kuwait.

- Seismic qualification tests on Sandwich type Busway system M/s. Federal Transformers Co. LLC, Abu Dhabi, U.A.E.

- Seismic qualification tests on 800 kV, 2000A Resin Impregnated Paper transformer bushing & 420 kV, 3000A Resin Impregnated Paper transformer bushing for M/s. Massa LLC (Izolyator Company), Moscow Region, Russia.

- Seismic qualification tests on 415 V, 200 A Electrical Power Distribution Panel for M/s. Phoenix Mecano S.E. Asia Pte Ltd., Singapore.

- Seismic qualification tests on12kV Switchgear unit for M/s. AL – AHLEIA Switchgear Co. K.S.C.C., Kuwait.

- Seismic qualification tests on Sandwich type Busway system M/s. Federal Transformers Co. LLC, Abu Dhabi, U.A.E.

High Power Laboratory (HPL)

- Ability to withstand the dynamic effects of short circuit on 400 kVA, 33/0.415kV three phase transformer for M/s. LTL transformers Ltd., Colombo, Srilanka.

- Short time current test on 230kV Cable cleat for M/s Abdullah M Al shahrani factory, Riyadh, Saudi Arabia.

- Ability to withstand the dynamic effects of short circuit on 630kVA, 33/0.415kV three phase transformer for M/s. Alfanar Electrical systems, Saudi Arabia.

- Internal Arc Current test at 31.5kA for 0.5 seconds, Short time withstand current and peak withstand current tests at 31.5kA, 3s main circuit, earthing circuit, Test

Duties (T60, T30 and T10) on 24kV, 1250A MV Switchgear Panel for M/s. Parsian Tablo Aria Co., Iran.

High Voltage Division (HVD)

- Lightning impulse voltage withstand test on Distribution Transformer for M/s. Energy Pac. Engineering Ltd., Dhaka & M/s. Sena Kalyan Electric Industries, Chittagong, Bangladesh
- Lightning impulse voltage withstand test, Switching impulse voltage withstand test, RIV test, corona test on Line post insulator for M/s Tower Solutions, Canada
- 1000 hours ageing test on XLPE Cable for M/s REPL (Malaysia) Sdn Bhd, Malaysia.
- Lightning impulse voltage withstand test, RIV, Mechanical load test, Recovery of hydrophobicity test, Brittle fracture test, Power frequency voltage withstand test on long rod polymer insulator for M/s Myanmar Electrical Business Group Co. Ltd., Myanmar
- Power frequency voltage withstand test, Lightning impulse voltage withstand test, RIV test, Corona test on Insulator Strings for M/s. Verscence LA Granja Insulators, Segorio, Spain
- Lightning impulse voltage withstand test, Power frequency voltage withstand test on operating switches for M/s. Industrial Electrical Projects, Kuwait.
- Lightning Impulse Voltage withstand Test on 100kVA, 200kVA & 250kVA Distribution Transformers for M/s. System Engineering Ltd., Dhaka
- Lightning Impulse Voltage Test on 200kVA, 25kVA & 10kVA three phase Distribution Transformers for M/s. Navana Electronics Limited, Bangladesh
- Lightning Impulse Test on 200kVA, 11/0.415kV & 250kVA, 11/0.415kV Three Phase Distribution Transformers for M/s. JRC Powertech, Bangladesh
- Lightning Impulse Voltage test on 200kVA & 250kVA Transformers for M/s. Electro Mech Automation & Engineering Ltd., Dhaka.

Materials Technology Division (MTD)

- 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 and electrical properties.

Short Circuit Laboratory

- Temperature rise test, Insulating capacity test, Dielectric properties test, Short Time Current Icw at 16kA for 1 second test on Isolator, Breaking Capacity test Icu or Ics at 50kA, 800V on MCCB for M/s. Shanghai Liangxin Electrical Co. Ltd., China.
- Short time current test, Pre and post-test charges, Temperature rise test on Current Transformers for M/s. Tyco Electronics UK Ltd, U.K.
- Short Circuit testing of 400A & 800A Service Cabinet, 415V as per IEC 61439-1 and 2 for M/s. Al Hamad Industries International, Dubai.
- Dynamic Short Circuit Test (including all routine tests), Thermal Short Circuit Test (by actual test), Temperature Rise Test on 100kVA, 200kVA & 250kVA Distribution Transformers for M/s. System Engineering Ltd., Dhaka
- Short Time Current Test at 31.5kA/3s on link box for M/s. Evergrow Electrical Engineering Supplies Sdn. Bhd., Malaysia
- IK test using pendulum Hammer on 36 kV Dry Type Current Transformer for M/s. Esitas Instrument Transformers, Indonesia
- Dynamic Short Circuit Test (including all routine tests), Thermal Short Circuit test & Temperature Rise Test on 200kVA, 25kVA & 10kVA Distribution Transformers for M/s. Navana Electronics Limited, Bangladesh
- Dynamic Short Circuit Test, Thermal Short Circuit Test, & Temperature Rise Test on 200kVA, 11/0.415kV & 250kVA, 11/0.415kV Three Phase Distribution Transformers for M/s. JRC Powertech, Bangladesh
- Dynamic Short Circuit test (including all routine tests), Thermal Short Circuit Test (If conducted along with Dynamic Short Circuit test), Temperature rise test (if conducted on same transformer along with Short Circuit test) on 200kVA & 250kVA Transformers for M/s. Electro Mech Automation & Engineering Ltd, Dhaka

Switchgear Testing & Development Station (STDS), CPRI, Bhopal

- Ability to withstand the dynamic effects of short circuit test was conducted on a. 250kVA, 11/0.415kV. b. 1000kVA, 11/0.415kV. c. 200kVA, 11/0.415kV.Distribution transformer of M/s L&T Electrical & Automation Saudi Arabia Company Ltd., Dammam, Kingdom of Saudi Arabia. Mr. Punith.L, ASTA Observer, witnessed the test, on 28th May 2019.

- Demonstration of ability to withstand rated short-time neutral current test was conducted on 1000Amp, 33kV, 3 – Phase, Earthing Transformer of M/s Federal Power Transformers LLC, Abu Dhabi, Mr. Girjesh Tiwari, Plant Manager, witnessed the test from 11th to 14th June, 2019.

- Verification of Short circuit withstand strength test of main circuit test the test was conducted on 415V, 1600Amps LV DIN Feeder Pillar, (b)Verification of Short circuit withstand strength test of main circuit test, the test was conducted on Outdoor, LV DIN Feeder Pillar – RTLR (Real Time Load Reading Facilities) of M/s. Powerjog (M) SDN BHD., Shah Alam, Malaysia. Mr. Ramdzan Bin Ibrahim (Manager) & Mr. Abu Bakar Bin Kamaruddin (Joint Director, Electrical Eng.) witnessed the test on 22nd & 23rd January 2020.

- Impulse voltage withstand test on 250kVA 11/0.433 kV Distribution Transformer carried out for M/s. Adex Corporation Ltd, Dhaka, Bangladesh on 29th May 2019.

- Temperature rise test and Lightning Impulse Voltage withstand test were carried out on 1000kVA, 11/0.433 kV, 3 phase Distribution Transformer of M/s. Voltamp Transformers OMAN SAOC, Sultanate of Oman. Mr. Deepak Bujone & Mr. Zubair Khan witnessed the test on 13th November 2019.

- Impulse test and Temperature rise test was carried out on 5MVA/5.625 MVA, 33/11.55 kV 3 phase power transformer of M/s. Techno Venture Ltd, Dhaka, Bangladesh, on 5th & 20th February 2020. The tests were witnessed by Mr. Bimal Kumar Sarker, GM and Mr. Mubinul Haque, DM.

UHVRL, CPRI, Hyderabad

- Carried out all routine electrical tests on 420 kV, 3000 A, condenser type resin impregnated AC Bushing of M/s. Massa LLC, Russia, from 1st to 5th June 2019.

TESTING & CERTIFICATION UNDER UL (Underwriters Laboratories):-

- Conditional short circuit test at 36kArms & 21.6kArms on 250A, 400A, 800A & 1000A 415V 3 Pole MDB – LV PSC Assemblies as per IEC 61439-1 & 2 for M/s. Link Light Switchgear Industries LLC, Dubai, UAE on 29th & 30th April 2019.

- Short time withstand current at 18.24kArms for 1s and contact resistance measurement tests on 330A 1000V Terminal Blocks and Short time withstand current at 21.24kArms for 1s and contact resistance measurement tests on 350A 1000V Terminal Blocks as per IEC 60947-7-1 for M/s. Osada Co. Ltd., Tokyo, Japan, on 21st May 2019.

- Short time withstand current at 6.42kArms for 1s & 12kArms for 1s and Contact resistance measurement tests on 600V Terminal Blocks for M/s. MibuDenki Industrial Co. Ltd., Japan, on 12th July 2019.

TESTING & CERTIFICATION UNDER INTERTEK-ASTA:

- Testing of LT MPP Capacitor for M/s. Schneider Electric, Bengaluru
- Testing of LV Panel for M/s. L&T- India
- Testing of 12kV, 630A RMU, 12kV, 630A SF6 filled RMU, & 12kV, 630A VCB of RMU for M/s. Lucy Electric India Ltd, Nasik
- Testing of 800V, 2500A Distribution Board for M/s. L&T Electrical & Automation Saudi Arabia Co. Ltd., Dammam
- Testing of 2500A PSC Assembly for M/s. L&T, Saudi Arabia
- 800V, 2500A, 30kA Main Distribution Board for M/s. L&T Electrical & Automation Saudi Arabia Co. Dubai
- 12kV, 630A, 21.0kArms, 3 Way SF6 Insulator Extensible RMU, 12kV, 630A, 21.0kArms SF6 Insulator Extensible RMU & 12kV, 630A, 21.0kArms SF6 Insulator Extensible RMU for M/s. Lucy Electric India Pvt. Ltd., Nashik.

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 2019-20 are provided in Appendix-9.**

Section- 4

Consultancy Activities

CONSULTANCY ACTIVITIES

Capacitors Division (CD)

- On- line PD test by acoustic emission technique was carried out on Generator Transformers-6No., Startup transformer-6No., Station Transformer-1No., as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at site of M/s. NPCIL, TAPS 2&4, Tarapur.

- On-site Diagnosis & Condition monitoring of Circuit Breakers-17Nos., and Earth Switches-4Nos were carried out at M/s NHPC, Loktak Power Station, Loktak, Manipur, as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment.

- On- line PD test by acoustic emission technique was carried out on Generator Transformers-1No., Startup transformer-1No., Station Transformer-1No., as a part of consultancy work of Diagnostic and condition monitoring of Power Station equipment at site of M/s. NPCIL, TAPS 1&2, Tarapur.

- Condition monitoring of 400kV class EHV circuit breakers-7Nos., were carried out at Koteshwar Power station, at site of M/s THDC Limited- Koteshwar HEP, Tehri, as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment.

- On- line PD test by acoustic emission technique was carried out on Generator Transformers-1No., as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment, at site of 110/22kV Bahour substation, M/s. Electricity department, Govt. of Puducherry**,** Puducherry.

- On- line PD test by acoustic emission technique was carried out on Generator Transformer-2Nos., as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at site of M/s THDC Limited- Tehri HEP, Tehri.

- On- line PD test by acoustic emission technique was carried out on Generator Transformers-1No., as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at site of M/s THDC Limited- KOTESHWAR HEP, Tehri.

- On- line PD test by acoustic emission technique was carried out on Regulating and Rectifier Transformers-9Nos., as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at site of M/s. NALCO, Angul.

Power Systems Division (PSD)

- Protection Audit for WRTS-I & II, Phase II: PGCIL
- Protection Audit for UPPTCL 220 kV Substations
- Study and Third Party Protection Audit for PPGCL, PPS-III, Bawana, Delhi
- Study and Third party Protection Audit of 400/220/132 kV Substations and Generating Stations along with their respective switchyards of BBMB
- Testing of Power System Management System – Special protection system for M/s GE, Bengaluru on RTDS
- Protection Audit of M/s. Adani Electricity, Mumbai:
- Systems Study and protection audit of Goa Power systems
- Systems Study and third party protection audit of Chutak Hydro power plant, National Hydro Power Corporation
- Capacitor Bank requirement studies for the Northern Region
- Grid impact studies due to online short circuit test of 315 and 500 MVA transformers for National High Power Testing Laboratory, Bina, Madhya Pradesh

Special Consultancy Activities

Cables & Diagnostics Division (CDD)

- Diagnostic Test of 33 kV/132 kV/220 kV Equipment, Lighting Arrestor & Cables for M/s. Steel Authority of India Ltd., Rourkela.
- Diagnostic Tests on HV Electrical Equipment for M/s. Nuclear Power Corporation of India Ltd., Boisar.
- Diagnostic Tests on 132 kV CTs & CVTs for M/s. THDC India Ltd, Jhansi.
- RLA Studies of MBDPH on 2X130 MVA GTs of VUGPH, 1X8 MVA GT of BHEP & 2X10 MVA & 1X12 MVA GTs for M/s. Karnataka Power Corporation Ltd., Bagalkot District, Karnataka.

- Consultancy Assignment for Analysis & Submitting Final Report on aged Transformers & Reactors in Powergrid for M/s. Powergrid Corporation India Ltd., Bengaluru.

- ELCID Test on Unit # 3, Generator Stator Core, Partial Discharge Test on Hydro Generators of Unit # 3, Condition monitoring tests on Generators, Condition Monitoring Tests on HV Equipment & Diagnostic Tests on CTs 111.1 MVA Hydro Generators for M/s. NHPC Limited, Himachal Pradesh.

- Diagnostic Tests on Switchyard Equipment & Generator for M/s. NHPC Ltd., Manipur.

- Condition Monitoring tests on 10.5/220kV 120 MVA CGL for M/s. Bhakra Beas Management Board, Chandigarh

Distribution Systems Division (DSD)

- Third party inspection and Evaluation of Niranthar Jyothi Yojana (NJY) for M/s. Chamundeshwari Electricity Supply Corporation Ltd., Mysore

- Third party inspection of High Voltage Distribution System (HVDS) for M/s. BESCOM.

Energy Efficiency & Renewable Energy Division (ERED)

- Energy audit carried out at M/s. Brahmos Aerospace Pvt. Ltd, Nagpur.

- Energy audit carried out at M/s. Meenakshi Mission Hospital and Research Centre, Madurai.

High Voltage Division (HVD)

- Earth mat adequacy study at Linganamakki Dam Power House, Bhadra Power House and Earth resistance measurement at Sharavathi Generating Station.
- Earth Mat adequacy study at Varahi Underground Power House and Mani Dam Power House for M/s KPCL, Hosangadi.
- Pollution Mapping Studies at Nirsha, Dhanbad Jharkhand for L&T Ltd., Nirsha.
- Earth mat adequacy study for Mahatma Gandhi Hydro Electric Station for M/s KPCL, Jogfalls.
- Earth mat adequacy study for Gerusoppa Hydro Electric Station for M/s KPCL, Gerusoppa.
- Pollution Mapping Services for L&T Ltd., at Kaimur and Rothuk at Bihar and Chandoli at U.P.

Mechanical Engineering Division (MED)

- Design Vetting/approval of 66 kV D/C Type “PDCT1, PDCT2 (0-150)_12M BXA” Cable Termination pole, 110 kV D/C Type “PB +0M (2-150)” Single Side Arm Tension Utility pole, 220 kV Type ‘’PDT10, PDT20, PDT30 (38m) & PDT30 33.7m)’ Monopoles & 220 kV D/C Cable Termination Pole "220CT (0-5D)_15.6m BXA, 220 kV M/C Type “MPD (0-5^{O})/DE (0^{0})” Tension Pole, 66 kV D/C Type “PB (0-100), PC (10-30) & PD1 (60-90)/DE” Tension Pole, 220 kV D/C Type “PB (2-15), PC (15-30) & PD (30-60)/DE (0-150)” Tension Pole with +0m, +3m & +6m Body Extensions for M/s. Valmont Structure Pvt. Ltd., Pune.
- Design Vetting of 220 kV D/C Type DA, DB & DC Towers and Tower Spotting Data & Design Vetting/Approval of tower design calculations of 220 kV D/C “DD (30D-60D)/ (0D-15D) DE entry angle with +18m & +25m Body Extension” type tower for M/s. KEC International Ltd., Gurgaon.
- Review of Loads of 220 kV D/C towers to 132kV D/C towers with Moose conductor of M/s. K. Ramachandra Rao Transmission & Project Pvt. Ltd., Hyderabad.

- Review of Loads of 220 kV D/C with GSW Vs OPGW and Tower Spotting Data of M/s. L&T, Chennai.

- Design Vetting/Approval of Sag Tension Calculation for 220 kV D/C Tower with ACSR Zebra Conductor along with Earth Wire of SWG 7/3.15 (9.45mm Dia) & OPGW 24F (11.40 mm Dia) & 132 kV & 400 kV D/C type "DA", "DB", "DC" & "DD" towers for Bihar State Power Transmission Company Limited (BSPTCL), Patna.

- Design Vetting/Approval of Design of 66 kV D/C type "DE (0-150) BXA-15M" Cable Termination Monopole for M/s. Haryana Vidyut Prasaran Nigam Limited, Harayana.

- Design vetting/Approval of Design of 220 kV D/C Type "A (0-2O)" tower with +9M Body Extension for M/s. Punjab State Transmission Corporation Ltd (PSTCL)

- Design Vetting/Approval of the Foundation Design Calculations and Drawings of 132 kV D/C Type "DA (0-2O), DB (2-15O), DC (15-30O) & DD (30-60O)" Towers, Design of 220 kV D/C Type "DA (0-2O)" tower with +6M Body Extension as per revised IS 802 (P1/S1): 2015 for M/s. RS Infra Projects Ltd., Noida.

- Design Vetting/Approval of Pile Foundation design & Drawing of 132 kV D/C Type DD+6M Extension river crossing tower at location 28/0, 29/0 & 30/0 for M/s. RS Infra Projects Ltd., Noida.

- Design Vetting/Approval of Design of 400 kV D/C type "DB", "DC" Tower with +9M Body Extension for M/s. L & T Construction, Chennai.

- Analysis/Checking the Design of 400 KV D/C Type "DA (0-2O)" tower with +9M Body Extension for M/s. Punjab State Transmission Corporation Ltd.(PSTCL)

- Design Vetting /approval of structural design calculations and drawings for 40m height triangular tubular tower (Basic wind speed- 47 m/s) for M/s. Principle ACS Engineering India Pvt. Ltd., Hyderabad.

- Design of Pile Foundation for 110 kV D/C Type NB3, NB30 & NB60 60 tower at Chettiamkandiparamba Location for M/s. Kerala State Electricity Board Limited, Shoranur.

- Design Vetting/Approval of structural design calculations and single line drawing for 40m height towers for M/s. Ramboll India Pvt. Ltd., Hyderabad.

- Design Vetting/Approval of Design Calculations & Drawings of Pile foundation with Raised Chimney type for 220 kV D/C Tower from Sahsarsa (New) -Khagaria (New) (Location 64/3 to 65/7), GSS Amnour (BGCL) -220/132/133 kV GSS Digha (New), from GSS Amnour (BGCL) -220/132/133 kV -GSS Digha (New)on Turnkey for M/s. Associated Power Structures, Patna.

- Design Vetting /Approval of 66 kV D/C Type "PB (0-300)"Tension Pole with +0M, +3M, +6M & +9M body Extensions 220 kV D/C Type "PB (2-150), PC (15-300) & PD (30-600)/DE (0-150)" Tension Pole with +0m, +3m & +6m Body Extensions, for M/s. Associated Power Structures, Patna.

- Design Vetting/Approval of Design Calculations & Drawings of Pile foundation with Base Plate type for 220 kV D/C Tower from Sahsarsa (New) -Khagaria (New) (Location AP66, 66/1 and AP67), from Sahsarsa (New) –Begusarai Transmission Line with ACSR Zebra Conductor (Location AP29/A to AP33/0- 18 Locations), from Sahsarsa (New) –Begusarai Transmission Line with ACSR Zebra Conductor (Location AP27 to AP29- 03 Locations) on Turnkey for M/s. Associated Power Structures, Patna.

- Design Vetting /Approval of 400 kV D/C Type "PB" & "PD" Pole with +0M, +3M, +6M, +9M & +12M body Extensions for M/s. TSTRANSCO, Hyderabad

- Design Vetting /Approval of 220 kV D/C "DD+25" type tower Pile foundation for locations Nos 56/5, 56/9, 56/10, 56/11, 56/12, 57/0 & 58/0 at Gandhak River Crossing and 220 kV D/C "DD+18/25" type tower Pile foundation for locations Nos. 49A/0 at Boodhi Gandhak River Crossing for their utility of M/s. BSPTCL, Patna.

Section- 5

Promotional Activities

PROMOTIONAL ACTIVITIES

Important Conferences/Workshops Organised

- **National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies"**

  One day National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies", was organised by STDS-CPRI, Bhopal, at STDS-CPRI, Bhopal, on 15th November 2019.

- **National Seminar on "Testing & Certification of Transformer"**

  National Seminar on "Testing & Certification of Transformer as per IS:2026:IEC:60076", was organized by STDS-CPRI, Bhopal, at STDS-CPRI, Bhopal, on 3rd January 2020.

- **National Conference on "Recent trends in High Voltage Engineering & Technology (NCHVET-2020)"**

  National Conference on ""Recent trends in High Voltage Engineering & Technology (NCHVET-2020)", was organized by UHVRL-CPRI, Hyderabad, at UHVRL-CPRI, Hyderabad, on 24th January 2020.

- **National Seminar on "Grid connected Inverters"**

  National Seminar on "Grid connected Inverters" was organised by Energy Efficiency & Renewable Energy Division, CPRI, Bengaluru, at CPRI, Bengaluru, on 24th January 2020.

- **National Conference on "LT/HT Switchgear & Control gear-Smart Technologies"**

  National Conference on "LT/HT Switchgear & Control gear-Smart Technologies", was organized by STDS-CPRI, Bhopal, at Bhopal, on 28th & 29th February 2020.

- **Training Programme on "Smart Grid Technologies"**

  Three days Residential Training programme on "Smart Grid Technologies" for engineers from various utilities, was jointly conducted by CPRI and NSGM, at CPRI, Bengaluru from 22nd to 24th May 2019.

- **Training Programme' for Engineers of West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata**

  A 'Three Weeks Residential Induction Training Programme for Engineers of West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata was held at CPRI, Bengaluru, organized by Training Division, CPRI, Bengaluru, from 3rd to 22nd June 2019.

- **Training Programme for Engineers of M/s. RITES Limited.**

  Six days Residential Training Programme for Engineers of M/s. RITES Limited was organized by Training Division, CPRI, Bengaluru, at CPRI, Bengaluru, from 15th to 20th July 2019.

Awards & Accolades

- Ms. Ann Pamla Cruze , Engineering Officer Gr.3, CPRI, Bengaluru was awarded Ph.D. on the topic "Development of Alternate Eco-Friendly Insulating Liquids using Natural Esters and Synthetic Esters", by University of Mysore, Mysore, on 27th November 2019.

- Dr. M G Anandakumar, Joint Director- Training Division, CPRI, Bengaluru who authored and presented the paper titled "A Study on the Performance of High Emissivity Coating on Refractories for Energy Savings Application" at the International Conference on "Recent Advances on Renewable Energy- RARE - 2020", held at National Institute of Technology, Surathkal, Karnataka, from 7th to 9th February 2020, was awarded the '**2nd Best Paper Award'**

Participation in Conferences/Exhibitions

1) Elecrama 2020, Greater Noida:-

ELECRAMA 2020 exhibition, organized by IEEMA, New Delhi was held at the India Expo- Mart, Greater Noida from 18th to 22nd January 2020. CPRI has participated in the exhibition as a partner Power Pavilion put up by the 8 constituents, PFC, NTPC, POWERGRID, CPRI, EESL, NHPC, REC & SJVNL of Ministry of Power, Government of India.

Minister of State (IC) (Power and New & Renewable Energy) & Minister of State (Skill Development and Entrepreneurship) Sri R. K. Singh, Ministry of Power inaugurated Power pavilion and visited the CPRI stall. CPRI displayed its Credentials, Research, Testing facilities, Consultancy and Training activities. The Pavilion / stall witnessed many visitors from Industry, Research Organizations, Government, and Academia who interacted with CPRI Officers and showed interest in CPRI services. CPRI officers from Information & Publicity Division, CPRI, Bengaluru and CPRI-RTL, Noida manned the CPRI area of the pavilion.

Minister of State (IC) (Power and New & Renewable Energy) & Minister of State (Skill Development and Entrepreneurship) Sri R. K. Singh, Ministry of Power inaugurated Power pavilion and visited the CPRI Stall

2) Global Exhibition on Services 2019, Bengaluru

The Global Exhibition on Services 2019 organised by Ministry of Commerce and Industry in partnership with Services Export Promotion Council (SEPC) and Confederation of Indian Industry (CII) was held at Palace Grounds, Bengaluru, from 26th to 28th November 2019. Shri Piyush Goyal, Union Minister of Commerce and Industry & Minister of Railways inaugurated the event and Shri.Jagadish Shettar, State Minister of Large and Medium Scale Industries, Govt. of Karnataka was also present during the occasion. The show focused on strategic cooperation and developing synergies to strengthen multilateral relationships covering twelve service sectors.

CPRI participated in the Exhibition and showcased its State-of-the-art Research, Testing facilities, Consultancy and Training activities in the Stall under Energy Pavilion. Many visitors interacted with CPRI Officers and showed interest in utilization of CPRI services.

Visitors at CPRI Stall

3) The "Electric Myanmar 2019", Yangon, Myanmar

The "Electric Myanmar 2019" organized by M/s. Fireworks Exhibitions & Conferences in association with Myanmar Engineering Society and Myanmar Electrical and Electronic Association was held at Yangon, Myanmar, from 1st to 3rd August 2019.

Shri P. Kaliappan and Shri. G. Pandian, Joint Directors, CPRI, Bengaluru were deputed for manning the stall. CPRI participated in the Exhibition and Showcased its State-of-the –art research, Testing facilities, Consultancy and Training activities in the stall.

Mr. Er. Aung Myint, President (second to right),
Federation of Myanmar Engineering Societies visited CPRI stall

4) 8th ELASIA 2019, Bengaluru

8th ELASIA 2019, International Exhibition on Power, Electrical, Controls & Lighting was held at Bengaluru International Exhibition Centre (BIEC), Bengaluru, from 21st to 24th June 2019.

CPRI participated in the Exhibition and displayed its Credentials, Research, Testing facilities, Consultancy and Training activities in a Stall. The stall witnessed many visitors from Industry, Research Organizations, Government, and Academia who interacted with CPRI Officers and showed interest in CPRI services.

Delegates at CPRI stall along with Officials of CPRI

5) Grid Tech 2019 Exhibition:

Central Power Research Institute (CPRI) participated in GRIDTECH – 2019 Exhibition organized at Pragati Maidan, New Delhi, from 3rd to 5th April 2019. Dr. K.T. Varughese, Additional Director, CPRI, Bengaluru, Sri M.K. Jaiswal, Joint Director, RTL, CPRI, NOIDA, and Sri Ramadas, Engg. Officer, CPRI, Bengaluru promoted CPRI services at the Exhibition by setting up a stall.

Honourable Vice-president of India Sri. M. Venkaiah Naidu inaugurated GRIDTECH - 2019 exhibition. Mr. Ravi P Singh, CMD, Power Grid and Mr. A K Bhalla, Secretary (Power), Ministry of Power were present.

Delegates at CPRI stall along with Officials of CPRI

6) Boiler Indian Exhibition -2020

CPRI participated in Boiler Indian Exhibition- 2020, held at Mumbai, from 21st to 23rd February 2020. CPRI-TRC, Koradi Officers manned the stall.

Delegates at CPRI stall along with Officers of CPRI

Visits of Important Persons/ Foreign Delegations to CPRI

Cables & Diagnostics Division (CDD)

- Mr. Humaid Alshamsi, of M/s. Dubai Electricity and Water Authority, Dubai witnessed the type testing of 0.6/1 kV, 4CX120 Sq.mm, AL/XLPE/PVC/SWA/PVC Cable of M/s. Dubai Cable Company Pvt. Ltd., Dubai, during June 2019.

- Mr. Jorge Villate Isaza, Project Manager, M/s. Consorcio Qutub Minar witnessed the Flammability testing on Silicon Rubber Sample of M/s. Deccan Enterprises Limited, Hyderabad.

Electrical Appliances Technology Division (EATD)

- Mr. Craig Brunk from M/s. Bitrode Corporation, USA visited EATD, CPRI, Bengaluru, premises in March 2020 in connection with future infrastructure development of Battery tester for electric vehicle application.

Mr. Craig Brunk from M/s. Bitrode Corporation, USA with officers and staff of EATD

Earthquake Engineering & Vibration Research Centre (EVRC)

- Mr. Romanenko Pavel, Mr. Okunev Vladimir, Mr. Kiryukhin Pavel from Russia visited EVRC, CPRI, Bengaluru for witnessing Seismic testing of RID Bushing 800kV&420kV conducted for MASSA LLC, Russia, from 13th to 24th May 2019.

- Mr. Ivan Panfilov, Mr. Slavinskiy Alexander, Mr. Borichev Nikolai, Mr. Lunin Kirili, Mr. Andrey Shornikon from Russian Federation visited EVRC, CPRI, Bengaluru, for witnessing Seismic test conducted for MASSA LLC, Russia, on 22nd May 2019.

- Ms. Rakotondrasedo Meygret Hoby Elsie Don, Ms. Larbaoui Yasmine, Mr. Moras Thierry, Mr. Santamaria Gregor Mickael from France visited EVRC, CPRI, Bengaluru, for discussion regarding Seismic test through M/s. Alstom, on 16th October 2019.

- Mr. Rasmussen Kin Dahi, Mr. Sil Berbauer Kristian Quist from Denmark visited EVRC, CPRI, Bengaluru, for witnessing Pre Seismic testing activities conducted for M/s. Schneider Electric IT Business (I) Pvt. Ltd., from 6th to 13th November 2019.

- Mr. Plakhin Vladimir, Mr. Kiryukhin Pavel, Mr. Romanenko Pavel, Mr. Sipilkin Konstantin visited EVRC during 29th November to 6th December 2019 and Mr. Panfilav Ivan, Mr. Shornikov Andrey from Russia visited EVRC for witnessing test conducted for MASSA LLC, Russia, from 2nd to 6th December 2019.

High Voltage Division

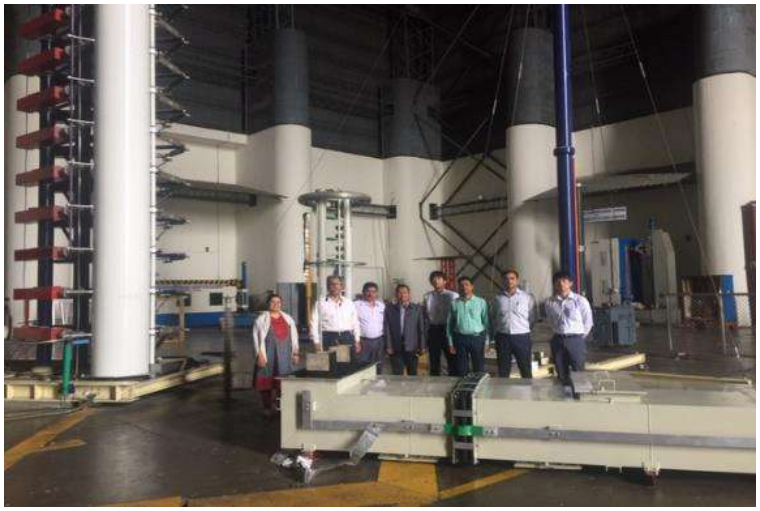
- Mr. M. T. Selvanathan and Mr. Md. Habibur Rahman of M/s Energy Pac Engineering Ltd., Dhaka witnessed the Impulse Test on 5kVA Transformer carried out at High Voltage Division, CPRI, Bengaluru, on 31st May 2019.

Visit of Mr. M. T. Selvanathan and Mr. Md. Habibur Rahman of M/s Energy Pac Engineering Ltd., Dhaka

- Mr. Ciropasini from M/s Tower Solutions, Canada witnessed the Radio Interference Voltage & Corona testing of 400kV Composite Insulator strings of M/s. Tower Solutions, Canada, on 29th November 2019.

Visit of Mr. Ciropasini from M/s Tower Solutions, Canada

- Mr. Kenta Idel, Mr. Hiroki Kikuchihara, from M/s. Toshiba, Japan, Mr. Mudjianto from M/s. Toshiba, Indonesia and Mr. Arurag Verma, Mr. Kamal Gupta from M/s. Toshiba, India along with Mr. B.S. Raju from M/s. Powergear Ltd., Chennai visited High Voltage Lab., CPRI, Bengaluru, for witnessing Lightning Impulse Withstand test on 1.1kV, 5100A & 630V, 6150A Non-Segregated Phase Busduct.



Visit of Mr. Kenta Idel, Mr. Hiroki Kikuchihara, from M/s. Toshiba, Japan, Mr. Mudjianto from M/s. Toshiba, Indonesia and Mr. Arurag Verma, Mr. Kamal Gupta from M/s. Toshiba, India along with Mr. B.S. Raju from M/s. Powergear Ltd., Chennai

- Mr. Win Myint Thein, Managing Director, Mr. Htun kywe, Consultant, Ms. Theint ko ko Hla, Secretary, Mr. Hayman Twin, AGM witnessed the Impulse Testing of 35kV, 70kN Polymer Long Rod Insulator of M/s. Myanmar Electrical Business Group Co. Ltd., Myanmar, on 30th December 2019.

Visit of Mr. Win Myint Thein, Managing Director, Mr. Htun kywe, Consultant, Ms. Theint ko ko Hla, Secretory, Mr. Hayman Twin, AGM

High Power Laboratory (HPL)

- Mr. Fabrice Maillard, Senior Commercial Proposal Manager, M/s. GE Energy Switzerland GMBH, visited HPL, CPRI, Bengaluru for signing of contract regarding the establishment of two new short circuit generators at HPL. Mr. Vincent Dieffenbacher, M/s. GE, Belfort, France and Mr. Gabor Kovacs, M/s. ABB, Switzerland visited CPRI for technical discussion regarding the establishment of two new Short Circuit Generators at HPL.

Visit of Mr. Fabrice Maillard, Senior Commercial Proposal Manager, M/s. GE Energy Switzerland GMBH, and Mr. Vincent Dieffenbacher, M/s. GE, Belfort, France and Mr. Gabor Kovacs, M/s. ABB, Switzerland

- Kick-off meeting of XII plan capital project, Augmentation of short circuit test facilities at High Power Laboratory, CPRI Bengaluru – Package- 1 Short circuit generator system (2x2500MVA) and its auxiliaries was organized from 21st to 23rd January 2020. Mr. Hemendra Gupta, Mr.Sharad Khatri, Mr. Raj K. Maurya, Mr. Israr Ahmad, Mr. Ashok R Gautam, Mr. Md. Masihuzzaman, Mr. Prantik Jana and Mr. Himesh Mishra from M/s. GEPSIPL, Mr. Bruno Gauchon and Mr.Vincent Dieffenbacher from M/s. GEES, Switzerland, Mr. Thomas B Benz, Mr. Oswin Moeller and Mr. Gabor Kovacs from M/s. ABB, Switzerland attended the meeting.

Visit of Mr.Hemendra Gupta, Mr.Sharad Khatri, Mr.Raj K. Maurya, Mr. Israr Ahmad, Mr. Ashok R Gautam, Mr. Md. Masihuzzaman, Mr. Prantik Jana and Mr. Himesh Mishra from M/s. GEPSIPL, Mr.Bruno Gauchon and Mr. Vincent Dieffenbacher from M/s. GEES, Switzerland, Mr.Thomas B Benz, Mr.Oswin Moeller and Mr.Gabor Kovacs from M/s. ABB, Switzerland

Metering & Utility Automation Division (MUAD)

- Dr. Tarlochan Sidhu, Dean and Professor, Faculty of Engineering and Applied Science, University of Ontario Institute of Technology (UOIT), Canada and CPRI Chair Professor, IISc, Bengaluru visited Substation Automation System Lab. and Metering Protocol Lab. of MUAD, CPRI, Bengaluru, on 24th January 2020.

Visit of Dr. Tarlochan Sidhu, Dean and Professor, Faculty of Engineering and Applied Science, University of Ontario Institute of Technology (UOIT), Canada and CPRI Chair Professor, IISc., Bengaluru

Mechanical Engineering Division (MED)

- Mr. David Majambere, Project Coordinator, REGIDESO, Burundi, Mr. Marco Ore Chavez, Transmission Line Engineer INTEC, Germany witnessed the Mechanical Strength Test on 220 kV S/C Type "D220 (10-45 Deg.)" Angle Tower at Mechanical Engineering Division, CPRI, Bengaluru, on 4th April 2019.

Visit of Mr. David Majambere, Project Coordinator, REGIDESO, Burundi, Mr. Marco Ore Chavez, Transmission Line Engineer INTEC, Germany

- Mr. Narayan Regmi, Assistant Manager, Nepal Electricity Authority (NEA), Kathmandu witnessed the Mechanical Strength Test on 220 kV D/C Type "DB" (0-15 Deg.) Tower, at Mechanical Engineering Division, CPRI, Bengaluru, on 3rd & 4th May 2019.

- Mr. Dereje Admasu, Civil Engineer, Mr. Mulugeta Mossisa, Electrical Engineer, Ethiopian Electric Power, Addis Ababa witnessed the Mechanical Strength Test on 400 kV D/C Type "DT" (30-60 Deg. Dev.) Tower with +12m Body Extension & +3m Leg Extension, at Mechanical Engineering Division, CPRI, Bengaluru, on 19th, 20th, 21st & 24th June 2019.

- Engr. Adelakun Kolade Oyeniyi, PM (T), Engr. Nwadike Morrison Chidi,Lines Project Engineer, Transmission Company of Nigeria (TCN) witnessed the Mechanical Strength Test on 132 kV D/C Type "DD10 (0-10 Deg.)" Tower with +9m Body & +2m Leg Extension at Mechanical Engineering Division, CPRI, Bengaluru, on 30th September 2019.

- Mr. Joseph A. Prado, Senior Engineer Civil Design, Ms. Adela L. Nivera, Senior Engineer Civil Design, National Grid Corporation of The Philippines, Philippines witnessed the Mechanical Strength Test on ± 20 kV HVDC Electrode Line Type "ETEN20" (0-20 Deg. Dev.) Tension Tower with +10.5m Body & +4.5m Leg Extension, at Mechanical Engineering Division, CPRI, Bengaluru, on 19th December 2019.

- Mr. Puli Narayana, G. M (Engineering), Mr. Shridhar Soundararajan, Project Engineer, LARICO Construction SDN BHD, Malaysia, Ms. Florence Sindun, Sr. Engineer, SARAWAK Energy Berhad, Malaysia witnessed the Mechanical Strength Test on 132 kV D/C Type "CQL" 0-2 Degree Suspension Pole with +3m Body Extension, at Mechanical Engineering Division, CPRI, Bengaluru, on 12th February 2020.

Visit of Sr. Engineer, SARAWAK Energy Berhad, Malaysia

Power Systems Division

- Dr. Tarlochan Sidhu, Professor & Dean, Faculty of Engineering and Applied Science, Ontario Tech University and CPRI Chair Professor at IISc., Bengaluru visited the Power Systems Division, CPRI, Bengaluru to hold Technical discussions regarding the ongoing R&D projects in the Division and suggest possible areas of interaction, on 22nd January 2020.

Visit of Dr. Tarlochan Sidhu, Professor & Dean, Faculty of Engineering and Applied Science, Ontario Tech University and CPRI Chair Professor at IISc., Bengaluru

- Dr. Balarko Chaudhuri, Faculty of Engineering, Dept. of Electrical and Electronic Engineering, Imperial College of London, present CPRI Chair Professor at IISc., Bengaluru, visited Power Systems Division, CPRI, Bengaluru to have technical discussion about the facilities and activities of the Division for possible future technical collaboration, on 7th August 2019.

- A Japanese delegation, Mr. Kono Yohei, Mr. Monden Kazuya and Mr. Suenaga shinya visited the PMU test facility in Power Systems Division, CPRI, Bengaluru to explore possibilities of collaboration with CPRI in the area of Power System Protection, on 29th August 2019.

Visit of Japanese delegation, Mr. Kono Yohei, Mr. Monden Kazuya and Mr. Suenaga shinya

Short Circuit Laboratory

- Mr. Hiroki Kikuchihara & Mr. Kenya Idei from M/s. Toshiba, Japan and Mr. Mudjianto from M/s. PT Circbon Energi Prasarana, Indonesia witnessed the Short-time withstand current test" at 30kA rms for 1s with 80kA peak carried out on 1.1kV 5100A Non-segregated Phase Busduct as per IEEE Standard C37.23 – 2015, for M/s. Powergear Ltd., Chennai, on 17th June 2019.

Visit of Mr. Hiroki Kikuchihara & Mr. Kenya Idei from M/s. Toshiba, Japan and Mr. Mudjianto from M/s. PT Circbon Energi Prasarana, Indonesia

- Mr. David Walker, Lead Engineer & Mr. Jose L Quintana, Project Engineer from M/s. SP Energy Networks, UK & Mr. Hari K Malapati, Group Technical Director from M/s. Wilson Power Solutions, UK and Mr. M Lava Kumar, Engineer & Mr. SK Subhani, Engineer from M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd. witnessed the Ability to withstand the dynamic effects of short circuit test carried out on 100kVA 11000/250-0-250V Single Phase Distribution Transformer, for M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd., Medak District, on 24th & 25th July 2019.

- Mr. C. S. Ravichandran & Mr. Rahul Kesarwani from M/s. Transrail Lighting Ltd., Mr. Mohammed Ahmed Mofleh Al Ahmad & Mr. Musa Tawfeeq Dwaileh AK Amaireh from M/s. NEPCO, Jordan, Mr. Yuvaraja Subramaniyan from M/s. EPE, Qatar and Mr. Tiziano Bianchini from M/s. CESI, Italy witnessed the Magnetic losses test as per IEC 61284 & Short-circuit current test carried out on 132kV Suspension Clamp as per Customer's instructions, for M/s. Transrail Lighting Ltd., Mumbai, on 7th & 10th December 2019.

- Mr. J Ramasamy, Senior Engineer – Engineering & Mr. K B Dinagaran, GM - Operations from M/s. Powergear Limited, Mr. K N Vinod Kumar, M/s. GE Power India Ltd., Bengaluru and Mr. Patrick Quinty from CSA Group, Canada witnessed the contact overload test at 2.4kA rms current carried out on 480V 240A Contactor as per Customer's requirement following CSA C22.2 No:254-05 Standard, for M/s. Powergear Limited, Chennai, on 17th December 2019.

- Mr. Mohammad Abdul Samad, Operation & Sales Manager from M/s. Abdullah M. Al. Shahrani Factory, Riyadh witnessed the Short-time withstand current and peak withstand current test at 25kA rms for 1 second with 62.5 kA peak carried out on Single Cable Cleats (Aluminium) suitable for Cable up to 132kV as per Customer's instructions for M/s. Abdullah M. Al. Shahrani Factory, Riyadh, KSA, on 20th January 2020.

- Mr. Harikrishnan K from M/s. Federal Transformers Co. LLC, Mr. Khalid Ahmed & Mr. Mohamad Moustafa Mahfouz from M/s. Dubai Electricity & Water Authority (DEWA), Dubai witnessed the verification of short circuit withstand strength tests on main, neutral and earth bus bars at 40kA rms for 1 second and all other type tests (including Dielectric properties, Temperature - rise, Mechanical Impact, Lifting, Mechanical Operation,

  Resistance to abnormal heat and fire etc.) carried out on 500V 1600A 8 Way LV Distribution Board as per IEC 61439-1: 2011 & IEC 61439-2:2011 for M/s. Federal Transformers Co. LLC, Abu Dhabi, UAE from 13th to 23rd January 2020.

- Mr. Kim Lai Law and Mr. Selvakumar from M/s. 3M Vietnam Ltd., Vietnam witnessed the Thermal Short circuit test through metallic screen at 0.89kA rms for 1 second and Thermal Short circuit test at 8.89kA rms for 1 second on Conductor carried out on Elbow separable connectors mounted on 22kV 3 x 50 sq.mm XLPE insulated Copper Cable for M/s. 3M Vietnam Ltd., Vietnam, as per IEC 60502-4:2010 on 17th & 18th February 2020.

Visit of Mr. Kim Lai Law and Mr. Selvakumar from M/s. 3M Vietnam Ltd., Vietnam

- Mr. Madhav Mishra from M/s Starline Holdings LLC, Canonsburg, USA witnessed the Verification of short circuit withstand strength test on main & neutral bus bars at various currents (20kA rms for 1 second with 40kA peak, 30kA rms for 1 second with 63kA peak, 36kA rms for 1 second with 76kA peak, 32kA rms for 1 second with 67kA peak, 50kA rms for 1 second with 105kA peak & 51kA rms for 1 second with 113kA peak etc.) carried out on 250A, 400A, 630A, 800A, 1000A & 1250A 415V Busbar trunking systems (Busways) respectively as per IEC 61439-1: 2011 & IEC 61439-6:2012, for M/s. Starline Holdings LLC, Canonsburg, USA, on 4th , 6th , 9th & 10th March 2020.

Visit of Mr. Madhav Mishra from M/s Starline Holdings LLC, USA

STDS-CPRI, Bhopal

- Mr. Md. Zahedul Islam, Mr. Md. Nayon Mia, Mr. Md. Hamidur Rahman of M/s. Confidence Electric Limited, Dhaka, Bangladesh visited Station-2, CPRI, Bhopal, for witnessing short circuit testing on Distribution Transformer, from 15th to 17th May 2019.

- Mr. Md. Abdul Kalam, Mr. Elisun Ali, Mr. Lucky Mony of M/s. Adex Engineering Ltd, Dhaka, Bangladesh visited CPRI, Bhopal for witnessing short circuit testing of Distribution Transformer, from 29th July to 9th August 2019.

- Mr. Md. Azad Rahman of M/s. Super Star Engineering Ltd, Dhaka, Bangladesh visited CPRI, Bhopal, for witnessing short circuit testing on distribution transformer, from 29th July to 9th August 2019.

- Mr. Wang Keming, Mr. Zhang Dongfeng, Mr. Chu Dongbin of M/s. Zhejiang Chint Electrics Co. Ltd, Wenzhou, China, visited Station-2, CPRI, Bhopal, for witnessing combined test sequence on LT ACB, on 22nd July 2019.

UHVRL – CPRI, Hyderabad

- Foreign delegates from Afghanistan, Bangladesh, Bhutan, Egypt, Ethiopia, Iraq, Nigeria, South Sudan, Sudan, Tanzania, Trinidad & Tobago visited UHVRL, CPRI, Hyderabad, under Industrial Visit Programme, on 16th September 2019.

Visit of foreign delegates

- Mr. Constatine Leonard Rubagumya & Mr. Izack Rabi Maro of M/s. Tanzania Electric Supply Company Ltd., Tanzania visited UHVRL-CPRI, Hyderabad, to witness tests on 400 kV conductor accessories of M/s. Asbesco (India) Pvt. Ltd, Kolkata, on 14th, 15th & 25th November 2019.

Visit of Mr. Constatine Leonard Rubagumya & Mr. Izack Rabi Maro of M/s. Tanzania Electric Supply Company Ltd., Tanzania

- Mr. Pavel Kiryukhin, Mr. Romanko Pavel and Mr. Plakhin Vladimir of M/s. Massa LLC, Russia visited UHVRL-CPRI, Hyderabad, to witness tests on 800 kV, 2000 A, Condenser type resin impregnated paper oil/air AC Bushing, from 11th to 17th December 2019.

Visit of Mr. Pavel Kiryukhin, Mr. Romanko Pavel and Mr. Plakhin Vladimir of M/s. Massa LLC, Russia

Information & Publicity Division (I&P Division)

- Mr. Morasm Thierry, Mr. Santamaria Gregor, Ms. Meygret Elsie and Ms. Yasmine Larbaoui Visitors from M/s. ALSTOM, France and Mr. Basu Ray Aritra & Mr. G Thiruvarul from India) visited CPRI, Bengaluru, to understand the testing facility at

CPRI, Bengaluru, on 16th October 2019. Information & Publicity Division, CPRI, Bengaluru, arranged visit to Earthquake Engineering & Vibration Research Centre, High Power Laboratory, High Voltage Division and Short Circuit Laboratory.

- Mr. El Sayed Abd from M/s. Elsewedy Electric, Egypt, visited CPRI, Bengaluru, to understand the testing facility available in CPRI, Bengaluru, on 25th October 2019. Information & Publicity Division arranged visit to High Power Laboratory, High Voltage Division and Short Circuit Laboratory.

- Mr.Madhukar Gundappa, Mr. Dhananjaya Bhat & Mr. Harsha Thyagaraja from M/s. Tata Consultancy Services, India and Mr.Vishy Seetharaman, Mr. Cory Bousquet from M/s. Sensata Technologies, USA & Mr.Jianjun Sun, China visited CPRI, Bengaluru, to understand the testing facility available at CPRI, Bengaluru, on 12th December 2019. Information & Publicity Division arranged visit to Earthquake Engineering & Vibration Research Centre, Power Systems Division and Short Circuit Laboratory.

- Mr. Habib Danaeifar, Mr. Mohammadreza Rezaei & Mr. Hassan Ghodratiamrollah from M/s. Fath Niroo Pars, Iran visited CPRI, Bengaluru, to understand the testing facility at CPRI, Bengaluru, on 30th December 2019. Information & Publicity Division arranged visit to Heat Run Test Laboratory, Short Circuit Laboratory, High Power Laboratory and High Voltage Laboratory.

Important Events

- **67th Technical Committee meeting of Short Circuit Testing Liaison (STL)**

67th Technical Committee meeting of Short Circuit Testing Liaison (STL) Member Laboratories was held at Hyderabad, on 19th & 20th November 2019. CPRI, India hosted the meeting and 32 members participated in the meeting.

Shri V S Nandakumar, Director General-CPRI & Shri S Sudhakara Reddy, Additional Director, Shri Rajarammohanrao Chennu, Engg. Officer Gr.3, CPRI, Bengaluru attended the above meeting.

The Group Photograph is given below:

Group Photograph of members of 67th STL Technical Committee Meeting

Annual Customer Meet 2019: -

- CPRI Annual Customer Meet-2019 was held at Gokulam Grand Hotel & Spa, Bengaluru, on 13th September 2019. A total of 69 Senior representatives from Industry and Utilities attended the meet.

  Shri V.S.Nandakumar, Director General, CPRI in his opening remarks informed Customers about the recent developments and future plans of CPRI. Dr. K.T. Varughese, Additional Director, Information & Publicity Division, CPRI, Bengaluru presented the Action Taken Report on the suggestions of the Customers made during the previous Meet 2018 held at CPRI, Bengaluru. Presentations on new facilities recently added by the Institute were made during the Meet which covered:

  - Creep Test Facility - by Shri Anantha Babu.M.D, Joint Director, Mechanical Engineering Division, CPRI, Bengaluru
  - Upgradation of CT-PT Test Facility - by Smt. Girija.G, Joint Director, Short Circuit Laboratory, CPRI, Bengaluru
  - Centre of Excellence for NDT - by Shri Janardhana.M, Joint Director, Materials Technology Division, CPRI, Bengaluru
  - New Test Facilities at UHVRL, Hyderabad – by Dr.Pradeep.M.Nirgude, Additional Director, UHVRL-CPRI, Hyderabad
  - Test facility for LED Lighting and Solar PV Modules & Motor Test facility - by Shri Sudhir Kumar.R, Joint Director, Energy Efficiency & Renewable Energy Division, CPRI, Bengaluru

  - The Meet was followed by the Open House wherein many Customers expressed their views and suggestions for better utilization of CPRI test facility. On conclusion of the Open House, the **Valued Customer Awards** were presented to the Customers of CPRI for the year 2018-19 in the categories of Sponsored Research & Development, Testing & Certification, Field Testing / Consultancy, Training, Overseas Customer and Emerging Customer under Testing & Certification category. This year, CPRI introduced Valued Customer Award for “Best State Utility” under the Category of Testing & Certification. The Customer Meet ended with a Vote of Thanks to the Chair, Customers and CPRI Officials. The Customers were taken for the Laboratory visit in the afternoon.

Opening Remarks by Director General, CPRI

Valued Customer Award in the category of Testing & Certification - Overseas Customer being presented by Director General, CPRI to Mr.Saiful Islam, AGM, Confidence Electric Ltd., Bangladesh

Valued Customer Award in the category of Best State Utility being presented by Director General, CPRI to Smt. Manisha Meshram, Chief General Manager (Purchase/QCMM), Madhya Pradesh Madhya Kshetra Vidyut Vitaran Co. Ltd, Bhopal

State Level Painting Competition on Energy Conservation

- The State Level Painting Competition on Energy Conservation -2019 was held in the premises of Centre for Collaborative and Advanced Research (CCAR), CPRI, Bengaluru in the morning hours on 14th November 2019. The competition was well attended by both Group -A and Group-B participants and we had a participation of 50 students in Group -A and 49 students from Group- B. The Prize Distribution function of the Painting Competition was held at CPRI Community Centre, CPRI Colony, Bengaluru.

- The prize distribution function was presided over by Shri. V. S. Nandakumar, Director General -CPRI, Mrs. Nazneen Banu, Director NGMA (Chief Guest) and Dr. K. T. Varughese, Additional Director, CPRI, Bengaluru graced the function. The Programme was co-ordinated by Dr. M G Anandakumar, Joint Director and State Nodal Officer, CPRI, Bengaluru. Prizes were distributed to the winners of both Group -A & Group-B Category. The programme was well attended by about 350 audience.

Dignitaries on the dias at Prize Distribution function of State Level Painting Competition on Energy Conservation -2019 (from left to right): Dr. K T Varughese, Additional Director, CPRI, Bengaluru, Shri V S Nandakumar, Director General-CPRI, Mrs. Nazneen Banu, Director NGMA & Mr. M G Anandakumar, Joint Director, CPRI, Bengaluru

Students at State Level Painting Competition on Energy Conservation -2019

Prize Winners of State Level Painting Competition on Energy Conservation -2019

Section- 6

Training Activities

TRAINING ACTIVITIES & PROGRAMMES

Seminars / Conferences / Workshops / Training Programmes organised by CPRI during the year 2019-20

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 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 personnel/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 2019-20:

Capacitors Division

1. On-site training program on “Condition Monitoring and Diagnostic Test on Transformers including on-line Partial Discharge measurement by on-line acoustic emission technique” for Officers & Engineers of TAPS 3 & 4, NPCIL, Tarapur held at M/s. Tarapur Atomic Power Station (TAPS 3 & 4) of NPCIL, Tarapur, Maharashtra, on 28th May 2019.

2. On-site Training Program on “Condition Monitoring and health Assessment of EM (Electro-Mechanical) Equipment at site”, at M/s. NHPC Loktak Power House, Bishnupur, Manipur, on 20th November 2019.

3. On Site Training Program on “Condition Monitoring and Diagnostic Tests on Transformers Including On-line Partial Discharge Measurement by On-line acoustic Emission Technique” for Officers & Engineers of TAPS 1 & 2, NPCIL, Tarapur held at M/s Tarapur Atomic Power Station (TAPS 1 & 2) of NPCIL, Tarapur, Maharashtra, on 22nd December 2019.

4. On- site Training Program on “On-line Partial Discharge Test by Acoustic Emission Technique on Power Transformers and offline Diagnostics test on Power Transformers”, for Officers & Engineers of Electricity Department, Puducherry, held on 5th February 2020.

5. On Site Training Program on “Online Acoustic Emission Techniques for Condition Monitoring of Transformers“, at 220kV Receiving Station, NALCO, Angul, Odisha for Officers & Engineers of NALCO, Angul, on 13th March 2020.

Cables & Diagnostics Division

6. On-site Training Programme on “Pre-Commissioning tests on EHV Cable Systems”, for KPTCL Engineers, held at Hoody site, on 29th August 2019.

7. On-site training program on “Diagnostic testing and Condition Assessment of HV Power Equipment”, held at NHPC Limited, Loktak Power Station, Manipur, on 23rd November 2019.

8. Workshop on “Assessment of Power Cables, Fire Retardant Low Smoke Materials”, held at CPRI, Bengaluru, on 6th February 2020.

9. Workshop on “Cable Accessories & their Installation”, held at CPRI, Bengaluru, on 7th February 2020.

Dielectric Materials Division

10. Training Programme on "Condition Monitoring of Transformers by Oil Analysis and Safe Handling of Power Transformers", held at TTIC, JK PDD, Jammu, on 1st August 2019.

11. Training Programme on “Condition Monitoring of Transformers by Oil Analysis and Safe Handling of Power Transformers", held at TTIC, JK PDD, Srinagar, on 3rd August 2019.

12. Certificate Course on Testing of “Lubricating oils” for DGPCL, Bhutan, held at CPRI, Bengaluru, from 23rd to 27th September 2019.

13. Two Days Training Programme on “Transformers Oil, Condition Monitoring of Transformer Oil & Maintenance of Transformer”, held at Hindalco Industries Ltd., MIDC Taloja, on 22nd & 23rd January 2020.

14. Training Programme on “Treatment of transformer mineral oil containing PCBs using the mobile PCB dechlorination system”, held at NLC Ltd., Neyveli, on 18th January 2020.

15. Training Programme on “Condition Monitoring of Transformer by Oil Analysis and Safe Handling of PCB contaminated Power Transformers”, held at Goa Electricity Department, Ponda, on 9th March 2020.

Electrical Appliances Technology Division

16. Workshop on “Significance of Ingress protection and testing modalities”, held at CPRI, Bengaluru, on 19th February 2020.

17. Workshop on “Growing Role for Battery Based Energy Storage in Transport and Electrical Power”, held at CPRI, Bengaluru, on 13th March 2020.

Earthquake Engineering & Vibration Research Centre

18. Tutorial on “Vibration and Seismic Testing of Equipment”, held at CPRI, Bengaluru, on 14th February 2020.

Energy Efficiency & Renewable Energy Division

19. One day awareness workshop on “Energy audit and energy efficiency” was conducted at M/s. Brahmos Aerospace Pvt. Ltd., Nagpur, on 3rd July 2019.

20. One day National Seminar Cum Workshop on “LED lighting systems and Intelligent Lighting” held at CPRI, Bengaluru, on 29th August 2019.

21. One day awareness workshop on “Energy Efficiency improvements, Energy Saving Measures and Energy Audit”, at M/s Meenakshi Mission Hospital and Research Centre, Madurai, on 15th November 2019.

22. One day National Seminar on "Grid Connected Inverters", held at CPRI, Bengaluru, on 24th January 2020.

High Voltage Division

23. Workshop on “Grounding Practices”, held at CPRI, Bengaluru, on 10th January 2020.

24. Workshop on “Grounding & Lightning of allied structures”, held at KPCL, Gerusoppa, Uttar Kannada District, on 30th January 2020.

High Power Laboratory

25. National Conference on "Transformers and Allied Equipment", held at Bengaluru, on 19th & 20th December 2019.

Materials Technology Division

26. Workshop on "Diagnostic studies of Hydro Power Plant equipment", held at THDC, Rishikesh, Uttarakhand, on 19th July 2019.

27. Workshop on "Fly ash Utilization and Coal Quality Impact on Boiler Performance", held at KPCL Design Complex, Bengaluru, on 20th March 2020.

Metering & Utility Automation Division

28. One day workshop on "Cyber Physical systems security for AMI', held at CPRI Bengaluru, on 29th November 2019.

29. One day workshop on 'Open protocol testing of Smart Energy Meter in Indian Scenario', held at CPRI, Bengaluru, on 13th December 2019.

30. One day workshop on "Smart Grid for TSSPDCL engineers" held at CPTI, TSSPDCL, Hyderabad, on 18th December 2019.

31. One Day National Seminar on 'Smart Meter testing qualification', held at CPRI, Bengaluru, on 20th February 2020.

Mechanical Engineering Division

32. National Seminar on "Design, Testing and Analysis of Power Transmission line components and Accessories", held at CPRI, Bengaluru, on 13th February 2020.

Power Systems Division

33. One day workshop on 'Smart Grid and Smart Electric Vehicle (SGSEV): Research Perspective', held at CPRI, Bengaluru, on 12th July 2019.

34. Two days training program on 'Power Systems Protection Audit' for NRPC Engineers, held at CPRI, Bengaluru, on 21st to 23rd August 2019.

35. One day workshop on 'Modelling and Simulation of Distributed Energy Resources using Real Time Digital Simulator', held at CPRI, Bengaluru, on 21st October, 2019.

36. Two days training programme on 'Study and Third Party Protection Audit' for M/s PPGCL, PPS-III, Bawana Delhi', held at CPRI, Bengaluru, on 13th & 14th November 2019.

37. One day workshop on Çyber Physical Systems Security for Advanced Metering Infrastructure (CPSSAMI), held at CPRI, Bengaluru, on 29th November 2019.

38. One Day Workshop on 'Power System Grid Operation using Synchrophasor Technology', held at CPRI, Bengaluru, on 6th December 2019.

39. Workshop on Internet of Things (IoT), Cyber Security and Smart Grid - Module 1: IoT Enabled Smart Grid, held at CPRI, Bengaluru, on 12th December 2019.

40. Workshop on Internet of Things (IoT), Cyber Security and Smart Grid - Module 2: Cyber Security for Smart Grid, held at CPRI, Bengaluru, on 13th December 2019.

41. Workshop/Training on Hands on Protection Relay School, Module 1: Generator Protection, held at CPRI, Bengaluru, on 6th February 2020.

42. Workshop/Training on Hands on Protection Relay School, Module 2: Transmission Line Protection, held at CPRI, Bengaluru, on 7th February 2020.

43. One day workshop on 'Power Quality Challenges with RE Integration in Smart Grid', held at CPRI, Bengaluru, on 28th February 2020.

Research & Development Management Division

44. Workshop on Joint Virtual Clean Energy Centres, was held at MANIT, Jaipur, on 12th & 13th September 2019.

Regional Testing Laboratory, Noida

45. Training Programme on "Testing and Evaluation on Liquid Dielectrics as per Latest Standards: New and In-Service", held at RTL-CPRI, Noida, on 26th July 2019.

46. Seminar on "Recent Trends in Electrical wire and Power Cable Technology," held at Vigyan Bhawan, New Delhi, on 19th February 2020.

Regional Testing Laboratory, Guwahati

47. Tutorial program on "Preventive Maintenance of Transformers by Transformer Oil Analysis and DGA", held at APDCL Training Institute, Narengi, Guwahati, on 19th July 2019.

Short Circuit Laboratory

48. National Conference on “Latest Trends and Developments in Low Voltage Switchgear, Controlgear and Associated Assemblies” LTCON – 2019, held at Bengaluru, on 20th September 2019.

49. Workshop on “Design, Testing and Analysis of Distribution Transformers for Optimal Performance Evaluation”, held at CPRI, Bengaluru, on 22nd November 2019.

50. Tutorial Program on “Significance and Testing Methodologies of Temperature Rise Test on Electrical Equipments”, held at CPRI, Bengaluru, on 31st January 2020.

Switchgear Testing & Development Station, Bhopal

51. One day National Seminar on “Latest Trends in Smart Meter & Prepayment Meter Technologies”, held at STDS-CPRI, Bhopal, on 15th November 2019.

52. Seminar on “Thermal performance on HV/LV Electrical Equipment”, held at STDS-CPRI, Bhopal, on 20th December 2019.

53. National Seminar on “Testing & Certification of Transformer as per IS:2026/IEC:60076, held at STDS-CPRI, Bhopal, on 3rd January 2020.

54. Two days National Conference on “LT / HT Switchgear & Controlgear – Smart Technologies”, organized by STDS-CPRI, Bhopal, at Bhopal, on 28th & 29th February 2020.

Training Division

55. Three Day Residential Training Programme on Smart Grid Technologies, for engineers deputed from various powers sector utilities in India organised in co-ordination with National Smart Grid Mission, Ministry of Power, Government of India, at CPRI, Bengaluru, from 22nd to 24th May 2019.

56. Three Weeks Residential Induction Training Programme for Engineers of West Bengal State Electricity Distribution Company Limited, (WBSEDCL) Kolkata, was held at CPRI, Bengaluru, from 3rd to 22nd June 2019.

57. Three Weeks Residential Induction Training Programme for Engineers of West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata, was held at CPRI, Bengaluru, from 22nd July to 10th August 2019.

58. An ‘Exclusive 6 Day Residential Training Programme on “Testing of Electrical Equipment” for Engineers of M/s. RITES, Chennai, was held at CPRI, Bengaluru, from 15th to 20th July 2019.

59. A 16 Days Residential Training Programme on various aspects related to transmission sector was conducted for M/s. West Bengal State Electricity Transmission Company Limited (WBSETCL), Kolkata, at CPRI, Bengaluru, from 26th August to 10th September 2019.

60. A 5 day Residential Training Programme on "Testing of Electrical Equipment" for Engineers of National Hydro Power Corporation Limited (NHPC), was held at CPRI, Bengaluru, from 16th to 20th September 2019.

61. A 5 day Residential Training Programme on "Testing of Electrical Equipment" for Engineers of National Hydro Power Corporation Limited (NHPC), was held at CPRI, Bengaluru, from 23rd to 27th September 2019.

62. A Three Weeks Residential Induction Training Programme for Engineers of West Bengal State Electricity Distribution Company Limited, (WBSEDCL), Kolkata, was held at CPRI, Bengaluru, from 2nd to 21st September 2019.

63. A '16 Days Residential Training Programme' (Batch No.-02), on various aspects related to transmission sector was conducted for M/s. West Bengal State Electricity Transmission Company Limited (WBSETCL), Kolkata, at CPRI, Bengaluru, from 7th to 22nd January 2020.

64. A 16 days Residential Training Programme on various aspects related to transmission sector was conducted for M/s. West Bengal State Electricity Transmission Company Limited (WBSETCL) at CPRI, Bengaluru, from 24th February to 10th March 2020.

Thermal Research Centre, Koradi

65. Training programme on "RLA of Boiler", at M/s. Jindal Steel & Power Ltd., Raigarh, on 30th April 2019.

66. Training programme on 'Welding, heat treatment, NDT of plant components", was held at Koradi Training Centre, KTPS, MSPGCL, Koradi, Nagpur, on 24th May 2019.

67. One day Training Programme on "Condition Assessment of Cooling Tower No.5 ", held at CPP, Nalco, Angul, on 26th September 2019.

68. Training Programme on "Condition Assessment of Concrete Structure of TG Deck", was held at Unit No.2, at Hirakud Power House of M/s. Hindalco Industries Ltd., Sambalpur, on 11th January 2020.

69. Seminar on "Non-destructive Evaluation (NDE) Based Condition Assessment of Plant Components", was held at CPRI-Nagpur, on 28th February 2020.

UHVRL, Hyderabad

70. One day Tutorial Program on “Dielectric and Special tests on Instrument & Power Transformers”, held at UHVRL, CPRI, Hyderabad, on 23rd August 2019.

71. One day Tutorial Program on “Analysis of Insulating Oil & its importance as a diagnostic tool in maintenance of Transformers”, held at UHVRL, CPRI, Hyderabad, on 18th October 2019.

72. One day Tutorial Program on “High Voltage Testing, Evaluation and Performance EHV/UHV Equipment including Pollution Tests”, held at UHVRL, CPRI, Hyderabad, on 22nd November 2019.

73. National Conference on “Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)”, held at UHVRL, CPRI, Hyderabad, on 24th January 2020.

Section- 7

Captial 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 of 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 by carrying out online short circuit testing of 765kV class Transformers on 11th September 2017 which has now become the World's first laboratory for the same. The test facilities at NHPTL are accredited as per ISO/IEC 17025:2005 ranging from 50MVA to 520MVA, 132kV to 765kV, 1 Phase & 3 Phase Transformers.

XII Plan Proposals

CPRI has been sanctioned with Rs.1182.00 Crores by MoP, Govt. of India as Govt. Budgetary Support during 12th Plan period including Rs.80.00 Crores for R&D Schemes.

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.

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.

3 YEAR ACTION PLAN PROPOSALS

"R&D Schemes of Ministry of Power being implemented through CPRI" with an outlay of Rs.90.8284 crore was approved on 20th August 2018, comprising of In house Research Schemes of CPRI (IHRD), Research Scheme on Power (RSoP) and R&D under National Perspective Plan (NPP).

The details of the XII plan projects/schemes & 3 Year Action Plan are given in the table below:

Details of XII Plan Projects/Schemes & 3 Year Action Plan:

Sl. No	Title of the Proposal	Cost (Rs. 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 & Modernisation 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, Bengaluru	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 B. Establishment of Short Circuit Testing of Transformers, Excitation System for existing Generator	120.00 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
3	Augmentation of Pre-Qualification test facilities at CPRI, Bengaluru	11.50
4	Establishment and Augmentation of Short Circuit test facilities at CPRI, Bengaluru.	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, Bengaluru	15.00
8	Establishment of Total Test Facility for Transformers at CPRI Western Zone	100.00
9	Setting up of Oil Testing Laboratory in the Western Zone	5.30
10	Establishment of Test facilities for Energy meter	10.00

11	Centre of Excellence for Non-Destructive Testing & Evaluation of Power Plant Components	8.00
12	Establishment of Phasor Measurement Unit (PMU) System Testing Calibration Lab.	6.65
13	Smart Grid Research Laboratory	11.05
IV	**R&D Schemes of Ministry of Power being implemented through CPRI**	90.8284

Physical Progress of Ongoing XII Plan Capital Projects

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

Project components:

(i) Augmentation of Energy Meter & Calibration Laboratory

The project is completed.

(ii) Augmentation of Protocol & Meter Testing Laboratory

Equipments procured. Civil works being executed by CPWD is in progress.

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

The project is completed.

II. Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment" under XII Plan, (Outlay: 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, Bengaluru

M/s. CESI, Italy has been appointed as global consultant.
M/s. CESI, Italy has submitted its two reports. Tender was floated and technical bid was opened. Contract agreement signed between GE & CPRI for supply of two 2500 MVA Short Circuit Generators and its auxiliaries.

Tender issued for procurement of Transformer.

(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. Package-1-Tender opened and placing of PO is in process, Package-2: Technical evaluation is in process and price bid will be opened after technical evaluation.

III. Establishment of New Test Facilities Projects (Outlay: Rs.356.10 Crores)

Project components:

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

Procurement of all equipment with respect to Earthquake Vibration & Research Centre, CPRI, Bengaluru is completed. Civil work has been handed over to CPWD for Dynamics Laboratory and building is in progress.

Tender has been opened for Civil works for the Tower Testing Station at UHVRL-CPRI, Hyderabad and the same is under review.

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

Most of the equipment are procured and installed. Major equipment like CT PT System, PD System are in advanced procurement stage.

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

Accessories for Impulse Current Generator have been installed and commissioned. Civil work is in progress.

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

The project is completed.

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 is completed. Construction of Guest House, Laboratories are in progress. Procurement of equipment is completed.

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

The project is completed

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

M/s. CESI, Italy has been appointed as Global Consultant. M/s. CESI, Italy has submitted the report. Civil work is in progress. Tender floated for procurement of equipment.

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 completed. MSEDCL has furnished the estimate for 220kV line and payment has been made. Shri R K Singh, Union Minister of State (IC) for Power and New & Renewable Energy, Government of India laid the foundation stone of new unit, Regional Testing Laboratory of Central Power Research Institute (CPRI) at Nashik, Maharashtra, on 30th January 2019. Construction of the building for Laboratories is in progress. MSEDCL has furnished the revised estimate for the 220kV line and 33kV line and payment for the same is made. Specifications for the complete facility are under finalization.

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

The project is completed.

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

The project is completed.

11. Smart Grid Research Laboratory

All items to be procured including software are in advanced stage of procurement. SATB, CCTB, VAPT, Relay test kit procurement is in advanced stage. Civil work is completed.

Section- 8

Administrative Matters

ADMINISTRATIVE MATTERS

Governance

The following distinguished persons have joined the Governing Council and the Society of CPRI as members in 2019-20:

1) Shri Sanjiv Nandan Sahai, IAS, Secretary, Ministry of Power has assumedcharge as President, Governing Council of CPRI

2) Shri Ashish Upadhyaya, IAS, Additional Secretary & Financial Advisor, Ministry of Power

3) Shri Guruprasad Mohapatra, Secretary, Ministry of Commerce & Industry, Dept. of Industrial Policy & Promotion vice Shri Ramesh Abhishek, IAS

4) Dr. Nalin Shinghal, Chairman & Managing Director, Bharat Heavy Electricals Ltd. vice Shri Atul Sobti

5) Shri K. Sreekant, Chairman & Managing Director, Power Grid Corporation of India Ltd.

6) Shri R.K. Chugh, President-IEEMA became the Member of CPRI Governing Council vice Shri Harish Agarwal

7) Shri Dinesh Kumar, IAS, Chairman, Discoms, C/o Jaipur Vidyut Vitran Nigam Ltd.

The following distinguished persons joined the Standing Committee of CPRI as Members in 2019-20:

1) Shri Ashish Upadhyaya, IAS, Additional Secretary & Financial Advisor, Ministry of Power became the Member of CPRI Standing Committee vice Shri Vivek Kumar Dewangan, IAS, Joint Secretary & F.A., Ministry of Power.

During the course of the year, the 83rd Standing Committee Meeting was held at CPRI, Bengaluru, on 4th September 2019 and 84th Governing Council Meeting and 42nd Annual General Meeting of CPRI Society was held at Ministry of Power, New Delhi, on 31st January 2020 to consider various issues pertaining to the Institute.

Important Events

- Shri S. Sudhakara Reddy, Additional Director, CPRI, Bengaluru chaired the BIS Sectional Committee meeting on Transformers, ET-16 at M/s. Cargill India Private Ltd., Pune, on 18th June, 2019.

- Shri. R A Deshpande, Additional Director, CPRI, Bengaluru attended the meeting on review of projects approved under Uchhatar Avishkar Yojana (UAY) Phase-II, at Ministry of HRD, Shastri Bhawan, New Delhi, on 20th May 2019.

- Local Inquiry Committee (LIC) members from VTU, Belgaum visited CPRI, Bengaluru, on 16th July 2019 for inspection of Laboratories, Infrastructure, Library, etc. in connection with continuation of VTU Research Centre at CPRI, Bengaluru for the Electrical, Mechanical and Civil Engineering branches for the academic year 2019-20. Recognition for the said branches of CPRI Research Center was renewed.

- Shri B.M. Mehra, Additional Director/Unit Head, STDS-CPRI, Bhopal attended 10th Annual General Meeting of National High Power Test Laboratory Private Limited, Bina, held on 28th December 2020.

Meeting of Technical Committee of Research

- The 21st Meeting of Standing Committee on R&D (SCRD) of CPRI was held at Central Electricity Authority, New Delhi, on 9th April 2019. The meeting was Chaired by Shri. Prakash S Mhaske, Chairperson, CEA, New Delhi. The meeting was attended by Deputy Secretary, (Finance), MoP, and Members from CEA, BHEL, POWERGRID, NTPC-NETRA, DSIR & NHPC. Progress of ongoing and completed projects were reviewed. Evaluation of Six (06) new projects were carried out.

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 2019-20, on 5th September 2019.

- A Memorandum of Understanding (MoU), was signed between National Smart Grid Mission Project Monitoring Unit (NSGM-PMU) and Central Power Research Institute for 2 years for imparting training on Smart Grid Technologies by CPRI to the engineers deputed from power sector utilities in India, on 22nd April 2019. .

- A renewal Memorandum of Understanding (MoU) was signed between M/s. West Bengal State Electricity Distribution Company Limited (WBSEDCL), Kolkata and Central Power Research Institute, for imparting Induction Training Programme for the engineers of WBSEDCL for a further period of 3 years, on 12th December 2019.

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 Celebration -2020 & CPRI Diamond Jubilee Celebrations was celebrated at CPRI, Bengaluru, on 16th January 2020. Prof. G.D. Yadav, (Padma Shri), Prof. Emeritus, Institute of Chemical Technology, Mumbai, Emeritus Professor of Eminence, JC Bose National Fellow and former Vice Chancellor, Institute of Chemical Technology, RT Mody Distinguished Professor & Tata Chemicals Darbari Seth Distinguished Professor of Leadership and Innovation, the Chief Guest of the function delivered Jawaharlal Nehru Birth Centenary Memorial Lecture on "The Global Energy Scenario and Hydrogen Economy", on the occasion. Dr. Charles Lobo, IPoS, Chief Postmaster General, Karnataka Circle, Bengaluru released Diamond Jubilee Special Cover. Shri V.S. Nandakumar, Director General-CPRI presided over the function.

Mylavarapu Subbalakshamma Award was awarded to Dr. Ann Pamla Cruze, Engineering Officer Gr.3, CPRI, Bengaluru being the best Lady Scientific/Engineering Officer for the most significant work done by her during the year 2019. 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 Dillip Kumar Puhan, Engineering Officer Gr.3, CPRI, Bengaluru, for the best research Paper titled "Application of Optoelectronic Technique for Detection of Air Corona, Surface Discharges at Cable Termination and End winding of Stator Coil" which was presented in the 4th International Conference on Condition Assessment Techniques in Electrical Systems - CATCON-2019, organized by IIT, Madras, from 21st to 23rd November 2019. This award is constituted by our former Director General Dr. B.S.K. Naidu. In the evening, a Cultural Programme (Magic Show performance by Shri Uday Jadugar, Uday's Magic World, Bengaluru) was arranged, which was attended by all employees & their family members.

From left to right (on the dias) : Dr.P. Thomas, Additional Director, CPRI, Bengaluru, Dr. Charles Lobo, IPoS, Chief Postmaster General, Karnataka Circle, Bengaluru , Prof. G.D. Yadav, (Padma Shri), Prof. Emeritus, Institute of Chemical Technology, Mumbai, Emeritus Professor of Eminence, JC Bose National Fellow and former Vice Chancellor, Institute of Chemical Technology, RT Mody Distinguished Professor & Tata Chemicals Darbari Seth Distinguished Professor of Leadership and Innovation, Shri V.S. Nandakumar, Director General- CPRI, and Shri R A Deshpande, Additional Director, CPRI, Bengaluru.

Dr. Ann Pamla Cruze, Engineering Officer Gr.3, CPRI, Bengaluru receiving Mylavarapu Subbalakshamma Award from the Chief Guest

Shri Dillip Kumar Puhan, Engineering Officer Gr.3, CPRI, Bengaluru, receiving the Shri B.M. Naidu Award from the Chief Guest

2) UHVRL, CPRI, Hyderabad celebrated “Institute Day” on 16th January 2020. Chief Guest Shri Avinash Pavgi, Chief General Manager, SR – II, PGCIL, Secunderabad addressed the gathering on the occasion.

Lecture by the Chief Guest

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:

- Welfare of the women employees of the organization
- Addresses the issues/ grievances concerning women employees and facilitates redressal of the same
- Manages the Creche in CPRI colony and provides necessary guidelines for its smooth functioning

The internal complaints committee of Women's cell investigates reported cases of sexual harassment of women in CPRI and submits its report to the disciplinary authority by recommending action to be taken against the accused employees. This is carried out as per the CPRI's Internal Policy for Prevention, Prohibition and Redressal of Sexual Harassment of Women at Workplace. The women's cell also looks into any other complaints by Women employees in workplace. The committee consists of five members from CPRI and one external member.

The Crèche at CPRI is open for employee's kids and is housed in CPRI colony. It is managed by women's cell with support of CPRI management and with two caretakers.

Health Talk :

On the occasion of International Woman's day, a health talk on "Polycystic Ovary Syndrome (PCOS)", was organised on 3rd March 2020 for the women employees of CPRI at CPRI, Bengaluru. The speaker was Dr. Athishaya Mamatha, BHMS, CCAH, FCAH, Satvam Speciality Centre.

CPRI women staff with Dr. Athishaya Mamatha

No sexual harassment case was reported during the year 2019-20.

Statement indicating total number of employees in the Institute and number of women employees in each category, as on 31st March 2020

Sl.No.	Post(s)	No. of employees	No. of women employees	Percentage of women employees
1	Director General	1	-	-
2	Director	0	-	-
3	Additional Director	18	1	5.56
4	Joint Director	44	7	15.91
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer (SG)	1	-	-
7	Scientists/Engg. Officers	124	17	13.71
8	Scientists/Engg. Assistants	28	2	7.14
9	Non-Tech Officers	11	3	27.27
10	Office Staff/Stenographer	87	33	37.93
11	Library staff	1	1	100.00
12	Technicians	69	-	-
13	Technical Attendant/Attendant	63	4	6.35
14	Drivers/Cook-cum-care taker	9	-	-
15	Multi-Tasking Staff	32	5	15.63
	Total	**489**	**73**	**14.93**

Staff strength of the Institute as on 31st March 2020

Sl.No.	Posts	Number of employees
1	Director General	1
2	Director	0
3	Additional Director	18
4	Joint Director	44
5	Chief Administrative Officer (SG)	1
6	Chief Accounts Officer (SG)	1
7	Scientific/Engg. Category	152
8	Technicians	69
9	Administrative & Supporting Staff	140
10	Supporting Technical Staff	63
	Total	**489**

Vigilance Activities

Ms. Trishaljit Sethi, IPoS, CVO of NTPC was assigned with additional charge of CPRI from 25th February 2020 as per Ministry of Power letter No. C-30019/14/2016 – V&S dated 25.02.2020, on superannuation of Shri. Birendra Kumar, IA &AS, CVO, Power Finance Corporation Ltd., New Delhi, on 31st January 2020.

'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 undertaken with IT usage and web enabled technologies like display of Status of booking of test dates is available in CPRI website. Technology communication with customers thorough emails, payment of test and consultancy fees through wire transfer, RTGS, e-tendering, posting of Formats for submission of research proposals, project reports in CPRI website. Transparency in all the technical, financial and administrative activities of CPRI is ensured.

On the occasion of Vigilance Awareness Week, Integrity pledge was administered to the employees on 28th October, 2019. The observance of Vigilance Awareness week concluded on 1st November, 2019 with an invited talk by Shri. A Gnanasekaran, Controller of Communications Accounts, Department of Telecommunication, Karnataka Circle and Chief Vigilance Officer, ITI Ltd., Bengaluru. The Chief Guest in his address emphasized vigilance awareness in day to day functioning and shared his knowledge on malafide intention and bonafide intention with special reference to Vigilance Awareness Week, so as to create a positive environment which will enable for taking decisions. The officers & staff of the Institute attended the function. A compliance report on observance of "Vigilance Awareness Week" at CPRI was submitted to CVC, New Delhi, on 15th November 2019.

Rotation 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

Pending case -1, Disposed case: 1

Information on Right to Information Act

CPRI has Right to Information (RTI) Cell to respond RTI applications and the RTI Cell consists of one CPIO, one CAPIO & one Appellate Authority under the Ministry of Power. The RTI Cell works with Shri R. A Deshpande, Additional Director, CPRI, Bengaluru as Appellate Authority, Shri M. Janardhana, Joint Director, CPRI, Bengaluru as Central Public Information Officer and Shri G. Kishore Kumar, Engineering Officer Gr.4, CPRI, Bengaluru as Central Assistant Public Information Officer.

The suomoto disclosure is organized and the information is uploaded on daily basis in web site of CPRI (www.cpri.in) under the RTI Act 2005, Section- 4 with all the details of staff and organization.

During the financial year 2019-20, the RTI Cell has received 83 number of applications on various subject matters, which are summarized as below:

No. of Applications received	Directly received applications	Applications forwarded by MOP	Applications forwarded by others	Applications transferred to other departments	Applications Rejected under the various clauses of Section-8 RTI
83	46	32	5	4	5

All the RTI applications were responded by RTI cell within the specified 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 T. Mallikharjuna Rao, Joint Director, CPRI, Bengaluru served as Liaison Officers for SC/ST & PWD and OBC categories respectively during the year 2019-20. Reservation registers and Roster registers were updated for the year 2019-20.

Dr. B.R. Ambedkar's 128th Birth Anniversary was celebrated at CPRI, Bengaluru, on 14th April 2019. A grand official function was organized to commemorate the Birth Anniversary of Dr. B.R. Ambedkar at CPRI, Bengaluru, on 19th July 2019. Shri Ashok Chalawadi, Joint Director from Department Kannada and Culture was the Chief Guest and the function was presided over by Shri V.S.Nandakumar, Director General –CPRI.

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 128th celebrations sweets were distributed to employees and cultural program was organized. In this connection, a cultural program Katha Keerthana by Dr. Lakshminarasaiah Lakshman Das, Karnataka Sangeeta Nrithya Academy awardee was organized.

Dr B.R. Ambedkar's 128th Birth Anniversary celebrations at CPRI, Bengaluru

Management of CPRI distributing the meritorious awards to the children of CPRI employees

Representation of Scheduled Caste, Scheduled Tribe & OBC as on 31st March 2020

Group	Total	SC	ST	OBC	Others
A	**178**	40	15	33	90
B	**132**	29	22	25	56
C	**147**	38	15	39	55
MTS	**32**	15	3	1	13
Total	**489**	**122**	**55**	**98**	**214**
Percentage	-	24.95	11.25	20.04	43.76

Representation of Physically Challenged Employees as on 31st March 2020

Sl.No.	Post(s)	No. of employees	No. of physically challenged employees	Percentage of physically challenged employees
1	Director General	1	-	-
2	Director	0	-	-
3	Additional Director	18	-	-
4	Joint Director	44	-	-
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer (SG)	1	-	-
7	Scientists/Engg Officers	124	5	4.03
8	Scientists/Engg Assistants	28	1	3.57
9	Non-Tech Officers	11	1	9.09
10	Office Staff/Stenographer	87	3	3.45
11	Library staff	1	-	-
12	Technicians	69	-	-
13	Technical Attendant/Attendant	63	4	6.35
14	Drivers/Cook-cum-care taker	9	-	-
15	Multi-Tasking Staff	32	-	-
		489	**14**	**2.86**

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 grievances received by the Cell are forwarded to the concerned Section/Division 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 Cell is on a regular basis.

During the year 2019-20, CPRI has redressed several grievance petitions including 20 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 grievances received and disposed:

Grievance Source	B/F Balance	Receipt During the Period	Total Receipts	Cases Disposed of During the Period	Closing Balance as on 31/03/2020	Yet to Assess	At our Office
DARPG	0	1	1	1	0	0	0
Local/Internet	2	8	10	8	2	0	0
Pension	1	2	3	3	0	0	0
PMO	1	5	6	6	0	0	0
Total	4	16	20	18	2	0	0

CPRI Library and Information Centre, Bengaluru

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 research scholars and the employees of the organization.

Number of Publications acquired during the year 2019-20:

The total stock in Library and Information Centre is 34,468 out of which 72 new publications were added during this year. The number of Journals subscribed this year is 22, out which 06 are Foreign Journals, 14 are Indian Journals (all are technical reference publications), 02 are Hindi Journals. Besides this, Library also subscribed 07 news-papers and 06 General Magazines for the readers. In addition to Journals, Library subscribed two Institutional Memberships (IIPE & CIGRE) this year.

Library and Information Centre has been downloading IEC Standards since 2003. During this year 56 international standards were downloaded and uploaded in Knowledge Management System portal (e-office). 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 according to subject wise.

Library and Information Centre is completely automated and is using KOHA open-source Library management software with WEB OPAC having unlimited users. All in-house operations are done through the software. Readers can access the library using WEB OPAC on their desktops.

New Services:

Library subscribed IEEE Digital Library Enterprise Level-1 Membership (350 downloading of articles) during this year. As a member of CIGRE, **e-cigre online** is accessible by users. The International Standards are uploaded in e-office Knowledge Management system portal. The Library and Information Centre is educating the readers on the use of WEB OPAC and other digital resources in Library.

Library and Information Centre organized book fair from 27th to 29th January 2020 at CPRI. As part of the event, book vendors from Bengaluru were invited to exhibit their new collections related to Electrical Engineering. CPRI employees got an opportunity to access the recently published books related to their domain.

Section- 9

Finance & Accounts

Finance & Accounts

The Institute's financial performance during the year 2019-20 and for the last four years is given below:

Revenue earnings during the past five years

Year	Revenue (Amount in Crores)
2019-2020	160.07
2018-2019	204.49
2017-2018	191.05
2016-2017	183.85
2015-2016	159.20

Increased services rendered to the Utilities and Industries are well reflected in the financial performance raising the revenue earnings from Rs.159.20 crores in 2015-2016 to Rs.160.07 crores during the current year. During the year under report, as against the revenue realization of Rs.160.07 crores, the expenditure on non-plan activities stood at Rs.14559.93 lakhs resulting in a surplus of Rs.1447.78 lakhs. For the 31st year in succession, the Institute has not drawn any Non-Plan Grant-in-Aid from the Government of India.

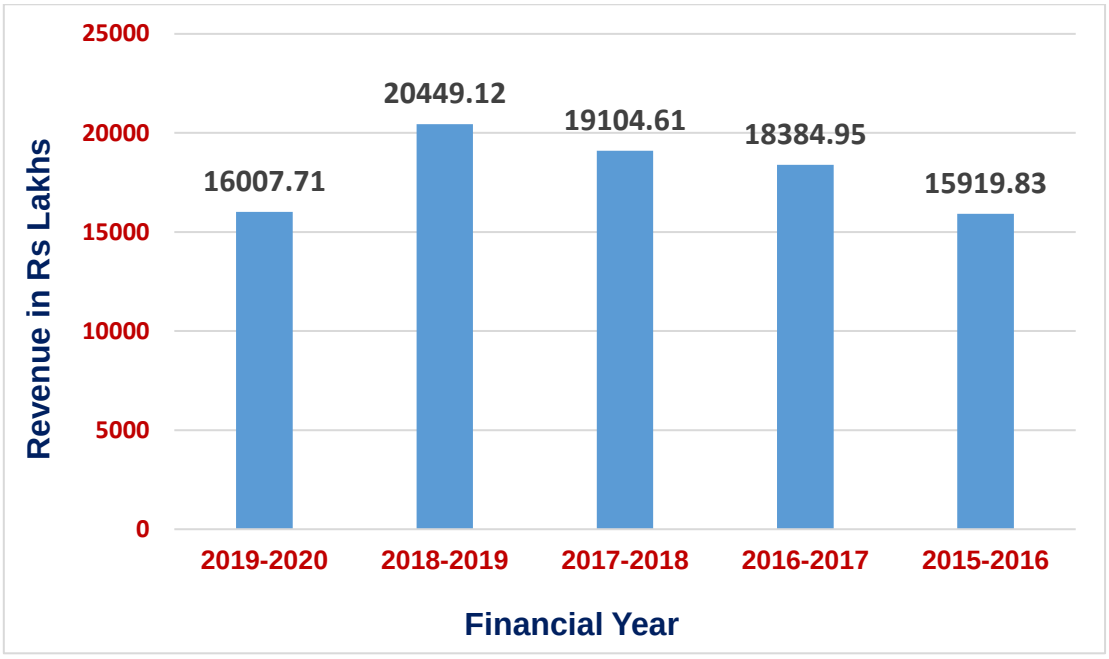
During the year, the expenditure under various heads has been as follows:

Non Plan Expenditure	Rs.14559.93 lakhs
Plan R & D Expenditure	Rs.280.08 lakhs
Plan Capital Expenditure	Rs.11271.71 lakhs
RSoP Schemes	Rs.312.64 lakhs
NPP Schemes	Rs.143.48 lakhs

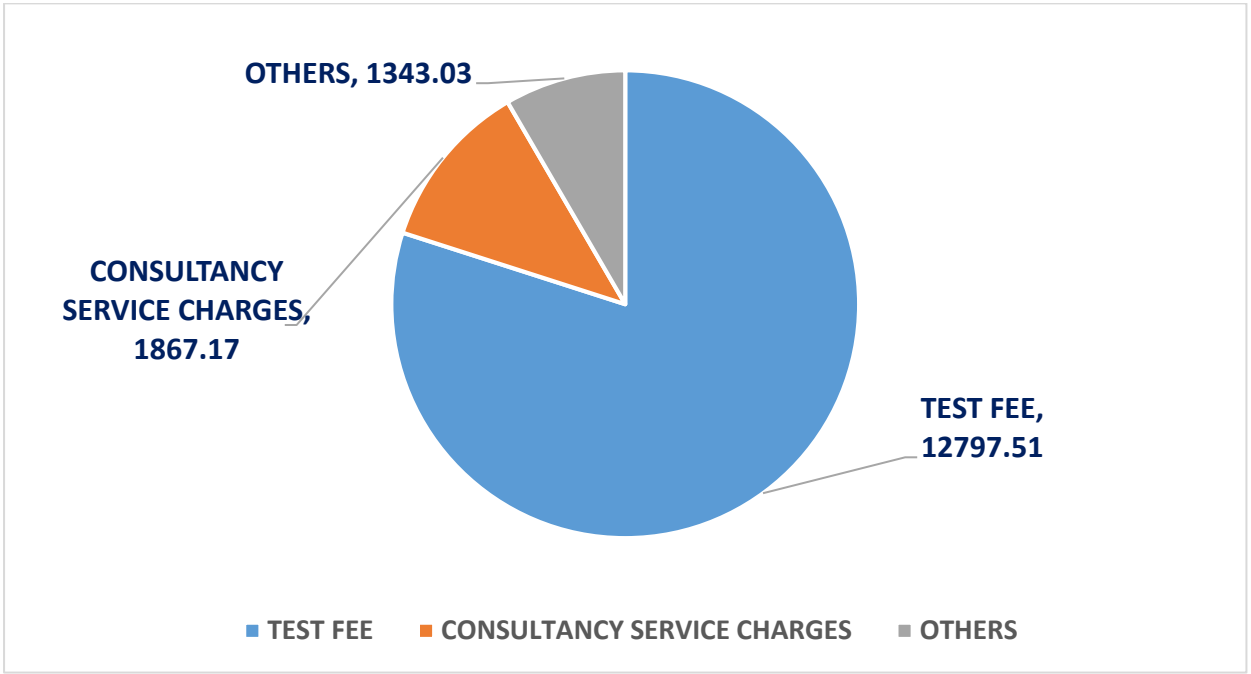
The Institute received Grants-in-aid (Plan) of Rs.17800.00 lakhs from the Government of India during the year. The details along with Auditors Report are furnished in Appendix–11.

As at the end of March 2020, the capital investment by the Government of India on the Institute has been Rs.108693.58 lakhs.

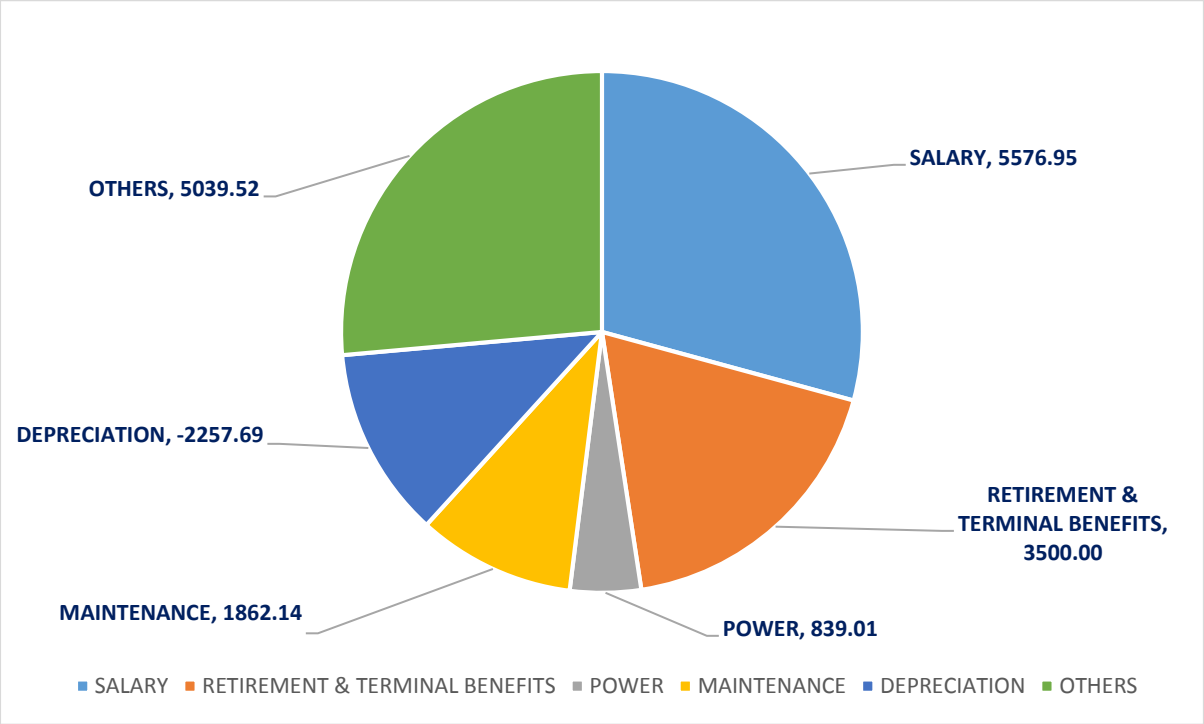
REVENUE EARNINGS DURING THE PAST FIVE YEARS (Rs. in Lakhs)



REVENUE DURING 2019-20 UNDER MAJOR HEADS (Rs. in Lakhs)



EXPENDITURE DURING 2019-20 UNDER MAJOR HEADS (Rs. in lakhs)



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 2019 – 20 are listed below:

1. Seminars and Workshops:

A) Table Workshops:

Purchase Division, Heat Run Test Laboratory, Information & Publicity Division, Short Circuit Laboratory, Security, Capacitors Laboratory and Electrical Appliances Technology Division, CPRI, Bengaluru were inspected with regard to Official Language Implementation and a follow up table workshop was conducted to guide the employees regarding use of Hindi in official work & presentation of statistical data of Hindi correspondence and ensuring that Name plates, Name boards, Sign Boards, Rubber Stamps, Visiting Cards etc. were in Hindi.

B) One day Workshop on "Information Technology for effective Implementation of Official Language Hindi in Office"

One day Workshop on "Information Technology for effective Implementation of Official Language Hindi in Office" was organized for the ministerial staff of the Institute on 20th December 2019 at CCAR Lecture Hall. The Speaker was Dr. S.N. Mahesh, Sr. Translation Officer, CAIR, DRDO.

Participants during Hindi workshop

2. Celebration of Hindi Month and Hindi Divas :

Hindi Month was observed from 27th August 2019 to 24th September 2019. Various competitions such as Quiz, Antakshari, Vocabulary and Spellings, Crossword Puzzle, General Knowledge (Written), Song, Humorous Conversation, Technical Article Competition and original Noting and Drafting under incentive scheme were organized as part of the Hindi Month celebration.

Hindi Divas : Hindi Divas was Celebrated at CPRI, Bengaluru, on 24th September 2019. Dr. Narayan Panigrahi, Scientist 'G', CAIR, Bengaluru was the Chief Guest of the function.

Prizes were distributed to the winners of various competitions held during the Hindi month. Cash Prizes were awarded to all the winners under the incentive scheme for original noting and drafting in Hindi. Cash prizes were also given to the winners for writing the best Technical Articles in Hindi, for member offices of the Town Official Language Implementation Committee, Bengaluru, sponsored by CPRI.

Celebration of Hindi Divas at CPRI, Bengaluru

3. Tenders/Publications in Bilingual :

A. All the Notice Inviting Tenders, E-Tenders, Corrigendum, Addendum, Notice Inviting Quotation etc. from Civil Engineering Division, Mechanical Engineering Division, Purchase Section etc. are being issued and published in bilingual in Newspapers. Also, they are uploaded on the CPRI website simultaneously.

B. **Annual Report** - The Annual Report of the Institute for the year 2018-19 has been published in bilingual.

C. **CPRI News** - The four issues of the quarterly magazine of the Institute "CPRI News" have been brought out in bilingual.

D. **Brochures of all Seminars/ Invitation cards/ revised purchase formats, Roving Calendar in bilingual**

The brochures of all Seminars/ Conferences / Workshops / Training Programmes organised in the Institute, All Invitation cards of the Institute, revised purchase formats, Roving Calendar of the Institute were brought out in Bilingual.

4. Rajbhasha Samachar :

The 6th edition of Rajbhasha Samachar which gives a brief report of the remarkable achievements of the Institute in the field of Official Language Implementation during the year 2018 – 19 was brought out.

5. Awards under Incentive Scheme :

A. Noting and Drafting in Hindi

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

B. Annual Technical Article Competition

To promote Hindi writing in Technical field, the Institute is organizing an Annual Technical Article Competition for the past 25 years for the Scientists of all Central Govt. Organizations. The best three articles were awarded prizes on Hindi Divas held at CPRI, Bengaluru, on 24th September 2019.

First Prize : Microwave Tube Research and Development Centre, Bengaluru

Second Prize : Silkworm Seed Technology Laboratory, Bengaluru

Third Prize : Fluid Propulsion System Centre, Bengaluru & Center for Artificial Intelligence & Robotics, Bengaluru

6. 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, Bengaluru.

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 and Notings printed on file folders:

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

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 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.

7. Web Site :

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

8. TOLIC Activities:

CPRI successfully sponsored and organized a Hindi Cross Word Puzzle Competition on 23rd October 2019 for the member offices of TOLIC (II). There was an overwhelming response from the participants. Cash Prizes were given to the winners on the occasion of Joint Hindi Divas held at CMTI, Bengaluru, on 18th December 2019.

CPRI Officers and employees received 5 prizes in various competitions held under Inter Organizational Competitions for the member offices of TOLIC (II).

Section- 11

Appendix - 1 to 11

केन्द्रीय विद्युत अनुसंधान संस्थान
CENTRAL POWER RESEARCH INSTITUTE
बेंगलूर
BANGALORE
स्थापित 1960 ESTD 1960

Appendix – 1

THE MEMBERS OF STANDING COMMITTEE AS ON 31ST MARCH 2020

Sl.no.	Present Incumbent/Nominee	Status
1	Additional Secretary/Special Secretary (In Charge of work relating to CPRI) Ministry of Power Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Chairman
2	Shri Ashish Upadhyaya, IAS Additional Secretary & Financial Adviser Ministry of Power Shram Shakti Bhawan Rafi Marg, New Delhi – 110 001	Member
3	Shri Prakash.S. Mhaske Member (Power System) Central Electricity Authority Sewa Bhawan R.K.Puram New Delhi – 110 066	Member
4	Shri Raj Pal, IES Senior Adviser 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 Bengaluru–560 080	Member- Convener

Appendix-2

THE MEMBERS OF COMMITTEE ON TESTING & CERTIFICATION AS ON 31ST MARCH 2020

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) Bengaluru-560 012	Shri D.K. Aggarwal Scientist F and Head, Bureau of Indian Standards Peenya Industrial Area, 1st Stage Tumkur Road, Bengaluru-560 058
Shri A.K. Gupta Director (Commercial) NTPC Ltd., Engineering Office Complex, Sector-24, Noida-201 301 (U.P.)	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 Bengaluru-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 Bengaluru- 560 001	Shri P. Narasimha Murthy Retd. Chairman, Karnataka Power Transmission Corpn. Ltd., No. 817, 6th Cross, MCR Layout, 5th Main, Vijayanagar, Bengaluru - 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, Bengaluru - 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 Bengaluru - 560 066
Executive Director Southern Region Transmission System – I, Power Grid Corporation of India, Sahakara Bhavana, # 32, Race Course Road, Bengaluru - 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., Bengaluru - 560 080

Appendix-3

THE MEMBERS OF STANDING COMMITTEE ON RESEARCH & DEVELOPMENT (SCRD) AS ON 31ST MARCH 2020

Sl. No.	SCRD - Main Committee	Name & Address	Position
1	Chairperson I/c. CEA, New Delhi	Shri. Prakash S Mhaske Chairperson I/c. Central Electricity Authority New Delhi	**Chairman**
2	Addl. Secretary & FA, Ministry of Power, Govt. of India	Shri. Ashish Upadhyaya, IAS Addl. Secretary and FA Ministry of Power, Govt. of India Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Member
3	Economic Advisor & Joint Secretary (I/C) of R&D, Ministry of Power, Govt. of India	Shri Raj Pal, IES Senior Adviser Ministry of Power, Govt. of India Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Member
4	Member Planning (R&D) CEA	Shri. Sandesh Kumar Sharma Office of Member Planning Central Electricity Authority, 3rd Floor, Sewa Bhavan R K Puram, Sector -1, New Delhi – 110 066	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 Conservation	Prof. S. V. Kulkarni, FINAE Professor Department of Electrical Engineering 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
10	DIPP-IPR Expert	Deputy Secretary Dept. of Industrial Policy & Promotion (DIPP) Ministry of Commerce & Industry, Udyog Bhavan New Delhi – 110 011	Member
11	CEA	Shri A K Rajput Chief Engineer (R&D) Central Electricity Authority, 3rd Floor, Sewa Bhavan R K Puram, Sector -1, New Delhi – 110 066	Member
12	Director General CPRI	Shri V S Nandakumar Director General, Central Power Research Institute P.B. No.8066, Prof. C V Raman Road, Sadashivanagar, Bengaluru – 560 080	**Convener**
	Special Invitee		
13	BHEL	Director (Incharge of R&D), BHEL, New Delhi	Member
14	POWERGRID	Director (Incharge of R&D) Power Grid Corporation of India Ltd. 'Saudamini', Plot No. 2, Sector- 29, Gurgaon – 122 001, Haryana	Member

15	NTPC	Executive Director NTPC (NETRA) E3 ECOTECH-II, Udhyog Vihar, Gautam Budh Nagar – 201 306 Uttar Pradesh	Member
16	NHPC	Director (Incharge of R&D) NHPC NHPC Office Complex Sector-33 Faridabad – 121 003	Member
17	MNRE	Dr P C Maithani Scientist -G Ministry of New and Renewable Energy Block 14, CGO Complex, Lodhi Road New Delhi – 110 003	Member
18	DST	Dr Sanjay Bajpai Head Technology Missions Division (Energy, Water & all Other) Department of Science & Technology, Technology Bhavan New Mehrauli Road New Delhi - 110 016	Member

Appendix – 4

The Members of Technical Committee on Thermal Research as on 31st March 2020

Sl. No.	Affiliation	Position	Name & Address
1	Professor from IIT-B, Mumbai	Chairman	Prof. R P Vedula, Dept. of Mechanical Engg. IIT-B, Powai, Mumbai – 400 076
2	ED, NTPC, NETRA	Member	Executive Director NTPC-NETRA E3 ECOTECH-II, Udhyog Vihar Gautam Budh Nagar – 201 306 Uttar Pradesh
3	ED- BHEL (Thermal)	Member	Executive Director BHEL-PEM Bharat Heavy Electricals Ltd. PPEI Building Plot No.25, Sector -16A Noida - 201 301
4	Chief Engineer, (TETD),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 Ramakrishna Gadre, Chief of Engineering The Tata Power Co. Ltd. Technopolis Knowledge Park, CENTEC, Mahakali Caves Road, Chakala, Andheri (E), Mumbai – 400 093
6	CPRI representative	Member	Dr. Saravanan V Joint Director, MTD, CPRI, Bengaluru
		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, Bengaluru

Appendix-5

THE MEMBERS OF TECHNICAL COMMITTEE ON HYDRO RESEARCH AS ON 31ST MARCH 2020

Sl. No.	Affiliation	Position	Name & Address
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	Executive Director (HE) Bharat Heavy Electricals Limited Piplani Bhopal – 462 022 (M.P.)
3	ED - NHPC (Hydro Expert)	Member	GM (O&M) Division NHPC Ltd., NHPC Office Complex Sector-33 Faridabad – 121 003
4	ED – SJVNL (Hydro Expert)	Member	Shri S.P. Pathak General Manager Electrical Design Department SJVNL Mehta Niwas New Shimla – 171 009
5	Chief Engineer, CWC, New Delhi	Member	Chief Engineer, Design (E & NE) Central Water Commission Sewa Bhawan, R.K. Puram New Delhi – 110 066
6	Chief Engineer, (HETD), 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, Bengaluru
		Member	Dr. R K Kumar Joint Director, MTD, CPRI, Bengaluru
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, Bengaluru

Appendix-6

THE MEMBERS OF TECHNICAL COMMITTEE ON TRANSMISSION RESEARCH AS ON 31ST MARCH 2020

Sl. No.	Affiliation	Position	Name & Address
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	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	Director (Transmission) Karnataka Power Transmission Corpn. Ltd. Kaveri Bhavan, K.G. Road Bengaluru – 560 009
6	Representative of IEEMA	Member	Mr. Mustafa Wajid Managing Director MHM Holdings Private Limited #52/1, Basappa Road Shanthinagar Bengaluru – 560 027
7	Representative of CPRI	Member	Smt. K.S. Meera Additional Director, PSD, CPRI, Bengaluru
		Member	Dr. P. M. Nirgude Additional 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, Bengaluru

Appendix-7

THE MEMBERS OF TECHNICAL COMMITTEE ON GRID, DISTRIBUTION & ENERGY CONSERVATION RESEARCH AS ON 31ST MARCH 2020

Sl. No.	Affiliation	Position	Name & Address
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	Dr. Ashok Kumar Director Bureau of Energy Efficiency 4th Floor, Sewa Bhawan, R.K. Puram New Delhi – 110 066
3	Chief Engineer (DP&D),CEA	Member	Chief Engineer (DP&D) Central Electricity Authority, R K Puram, Sector -1, 7th Floor, Sewa Bhavan New Delhi – 110 066
4	Representative from MNRE	Member	Dr. P.C. Maithani Scientist -G Ministry of New and Renewable Energy Block 14, CGO Complex, Lodhi Road New Delhi – 110 003
5	Representative of TANGEDCO	Member	Chief Engineer (IC, R&D) TANGEDCO, 4th Floor, Eastern Wing, 144, Anna Salai, Chennai – 600 002
6	Representative of IEEMA	Member	Mr. Mustafa Wajid Managing Director MHM Holdings Private Limited #52/1, Basappa Road Shanthinagar, Bengaluru – 560 027
7	Representative of CPRI	Member	Shri Sudhir Kumar R Joint Director, ERED, CPRI, Bengaluru
		Member	Shri Jyotibasu S Joint Director, ERED, CPRI, Bengaluru
		Member	Dr. Amit Jain Joint Director, PSD, CPRI, Bengaluru
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, Bengaluru

Appendix-8

PERSONNEL DEPUTED ABROAD FOR MEETING / CONFERENCE / PRE-DISPATCH INSPECTION OF EQUIPMENT DURING THE YEAR 2019-20

Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
1	2	3	4	5
1	V S Nandakumar Director General-CPRI M K Wadhwani Additional Director STDS-CPRI, Bhopal	For participating in the 45th STL Management meeting at Warwick, United Kingdom	Warwick, U.K.	16th & 17th May 2019
2	B A Sawale Additional Director STDS-CPRI, Bhopal	IEC TC 13/WG11,14,15 meeting held at Budapest, Hungary sponsored by BIS	Budapest, Hungary	13th to 17th May 2019
3	Jeykishan Kumar Engg. Officer Gr. 1 CPRI, Bengaluru	Pre-dispatch inspection for Photo-Biological test setup for LED Lamps and Luminaries at Bentham Instruments Ltd., UK	London, U.K.	3rd to 7th June 2019
4	Dr. B Nageshwara Rao Additional Director CPRI, Bengaluru	For presenting technical paper in International Conference on 37th Electrical Insulation Conference (EIC -2019) at Calgary, Canada	Calgary, Canada	16th to 19th June 2019
5	Ann Pamla Cruze Engg. Officer Gr. 3 (Gp. II) CPRI, Bengaluru	For presenting technical paper in International Conference of IEEE on Dielectric Liquids (ICDL 2019) at Rome, Italy	Rome, Italy	23rd to 27th June 2019
6	Shri P Kaliappan Joint Director CPRI, Bengaluru Shri Pandian G Joint Director CPRI, Bengaluru	For participating in the "Electric Myanmar 2019" Exhibition held at Yangon, Myanmar	Yangon, Myanmar	31st July 2019 to 03rd August 2019
7	Panneer Selvam Joint Director CPRI, Bengaluru A N Nampoothiri Engg. Officer Gr. 3 (Gp. II) CPRI, Bengaluru	Pre-dispatch inspection of "Servo Hydraulic Shaker System at M/s Link Engg. Co., Michigan, USA	Michigan, USA	12th to 16th August 2019
8	M Chandra Sekhar Engg. Officer Gr. 3 CPRI, Bengaluru	Third party witnessing of test on 90MVA, 132 KV/33 KV SPEC 308 transformer at M K Malaysia Transformer Sdn Bhd, KL, Malaysia	Kaula Lumpur, Malaysia	16th to 30th August 2019

9	Dr. Pradeep M Nirgude Additional Director UHVRL-CPRI, Hyderabad	For presenting technical paper in the 21st International Symposium on the High Voltage Engineering (ISH- 2019)	Budapest, Hungary	26th to 29th August 2019
10	Dr. R K Kumar Joint Director CPRI, Bengaluru	Pre-dispatch Inspection of "Scanning Electron Microscope (SEM) with EDAX	Cambridge, UK	17th to 20th September 2019
11	Jithin Pauly Engg. Officer Gr. 2 CPRI, Bengaluru	For participating in 10th IEC Young Professionals workshop at Shanghai, China	Shanghai, China	21st to 23rd October 2019
12	B A Sawale Additional Director STDS-CPRI, Bhopal	For attending the maintenance team of IEC 62052-11 under IEC/TC13/WG11	Wisebaden, Germany	6th & 7th November 2019
13	M Chandra Sekhar Engg. Officer Gr. 3 CPRI, Bengaluru	Third Party witnessing of test on 90 MVA 132 KV/33 KV Transformer at M/s. Malaysia Transformer Manufacturing Ltd.	Kuala Lumpur, Malaysia	6th to 20th December 2019
14	Sudhir Kumar R Joint Director CPRI, Bengaluru	BRICS Committee Meeting of Senior Energy officials	Moscow, Russia	20th & 21st February 2020

Appendix – 9

MEMBERSHIP OF CPRI OFFICERS IN INTERNATIONAL / NATIONAL COMMITTEES

Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
1.	Anupam Awasthi Additional Director CPRI, Bengaluru	Chairman	BIS Sectional Committee on Low Voltage Switchgear and Controlgear, ETD-07
2.	Meera K.S Additional Director CPRI, Bengaluru	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
3.	M.K. Wadhwani Additional Director STDS-CPRI, Bhopal	Chairman	High Voltage Switchgear & Control Gear Sectional Committee ETD-08 of BIS
		Member	BIS Power Transformers Sectional Committee ETD-16
			Fuses Sectional Committee BT- 39
4.	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, ETD-06
5.	B.A. Sawale Additional Director STDS-CPRI, Bhopal	Member Convener	BIS ETD-13
		Corporate Member	IETE
		Member	Expert Committee of Energy Metering- CBIP
			IEC TC13/WG11, WG14, WG15
			State Tariff Advisory Committee for MPSERC, Bhopal
6.	Swaraj Kumar Das Additional Director CPRI, Bengaluru	Member	BIS Sectional Committee, ETD – 34 & ETD- 07
7.	Dr. Pradeep M Nirgude Additional Director UHVRL-CPRI, Hyderabad	Principal Member	BIS ETD-48 - UHV AC Transmission Systems - Sectional Committee
			BIS-ETD-19- High Voltage Engineering Sectional Committee
			BIS ETD- 36 – Tools & Equipment for live working - Sectional Committee
		Alternate Member	Indian National Committee (IEC)
			Bureau of Indian Standards (BIS) ETD-30 - Surge Arresters Sectional Committee
			Basic Electro Technical Standards and Power Quality Sectional Committee ETD – 01

			Working Group WG-1 on Valve Electronics on Indigenous development of HVDC/FACTS Components formed by PGCIL (Power grid)
		Member	Power & Telecommunication coordination Committee constituted to examine the induction effects of HVDC Transmission lines –Sub-Committee
8.	S. Bhattacharya Additional Director CPRI- RTL, Noida	Member	BIS Committee on Instrument Transformers ETD-34
			BIS Committee Low Voltage Switchgear & Controlgear ETD-07
9.	S. Sudhakara Reddy Additional Director CPRI, Bengaluru	Chairman	BIS ETD-16 Transformer Sectional Committee
		Member	BIS ETD-08 - Sectional Committee on HT Switchgear
10.	Dr. P Thomas Additional Director CPRI, Bengaluru	Chairman	ETD-03 BIS Technical Committee
		Member	ETD-43 – Environmental Standardization for Electrical and Electronic Products and Systems, Bureau of Indian Standards, New Delhi
11.	Shivakumar V, Joint Director CPRI, Bengaluru	Member	IEC TC-57/WG15 (Security)
			BIS-LITD-10
			BIS ETD 13
			ISGF –WG 2: IoT, Smart Metering, AI & Analytics

		Member	ISGF –WG 3: Digital Architecture & Cyber Security
			ISGAN-SIRFN (International Smart Grid Action Network – Smart Grid International Research Facilities Network)
			IEEE-SA-PLC Test Bed Group
		Member Convener	BIS-LITD-10, Panel -2 (Security)
12.	K.P. Meena Joint Director CPRI, Bengaluru	Principal Member	BIS ETD-09 Power Cables Committee
13.	R. Sudhir Kumar Joint Director CPRI, Bengaluru	Principal Member	BIS-Sectional Committee ETD-23 "Electric Lamps and their Auxiliaries"
			BIS-Sectional Committee ETD-28 "Solar Photovoltaic Energy Systems"
			BIS Energy Storage Committee, ETD-52
		Life Member	Society of Energy Engineers and Managers
		Certified "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
14.	S. Jothibasu Joint Director CPRI, Bengaluru	Principal Member	BIS, Solar Pumps Committee
		Accredited "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
		Life Member	Society of Energy Engineers and Managers (SEEM)
		Member	Certified Internal Auditor of ISO 9001
15.	M.D. Anantha Babu Joint Director CPRI, Bengaluru	Principal Member	Conductors and accessories on Overhead Lines -BIS Committee ETD- 37, IEC/TC7 & TC-11

16.	Dr. M. Selvaraj Joint Director CPRI, Bengaluru	Main Member	Use of structural steel in overhead transmission line towers, structural engineering Sectional Committee – CED-7, BIS, New Delhi
			Standing committee of experts to investigate the cause of failure of towers, CEA / Powergrid, New Delhi
		Member	Committee for Audit of Transmission lines tower with respect to design & life of towers- CEA / Power grid, New Delhi
		Individual Member	SCB2 Overhead Lines, CIGRE, Paris
17.	Dr. V. Saravanan Joint Director CPRI, Bengaluru	Alternate Member	Clay and Stabilised soil products for construction, CED -30
		Life time member	Combustion Institute Pittsburg, USA
18.	Dr. Amit Jain Joint Director CPRI, Bengaluru	Principal Member	BIS-LITD10 (Power System Control and Associated Communications Sectional Committee)
		Member	BIS-ETD 46 (Grid Integration of Renewables)
		Life Member	Computer Society of India
			Indian Wind Energy Association
			Indian Society of Technical Education
19.	T. Bhavani Shanker Joint Director CPRI, Bengaluru	Chairman	Sectional Committee on Power Capacitors ETD-29 of BIS, New Delhi
		Member	NDT Level I Certified Engineer for Acoustic Emission testing as per American Society for Non-Destructive Testing (NDT).
			MT 14 “Series capacitors for Power systems” under IEC/TC 33

		Alternate Member	WG- 23 “Shunt capacitors of Selfhealing type for voltages above 1000V for Power systems” under IEC/TC 33
20.	S Shyam Sundar Joint Director CPRI, Bengaluru	Member	ETD-50 Sectional Committee of BIS
21.	J. Sreedevi Joint Director CPRI, Bengaluru	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
22.	G Pandian Joint Director CPRI, Bengaluru	Technical	BIS Sectional Committee on Tools and Equipment for live working, ETD-36
23.	P Kaliappan Joint Director CPRI, Bengaluru	Secretary	Panel 4 of LITD 10 PMU panel for PMU Testing and Certification
24.	G.R. Viswanath Joint Director CPRI, Bengaluru	Member	BIS Technical Committee ETD- 03 on Electro Technical Fluids
25.	Manoher Singh Takkher Joint Director STDS-CPRI, Bhopal	Member	High Voltage Switchgear & Control Gear Sectional Committee ETD-08 of BIS
26.	Sumbul Munshi Joint Director STDS-CPRI, Bhopal	Member	BIS Committee on Low Voltage Switchgear & Control gear ETD- 07
27.	N. Rajkumar Joint Director CPRI, Bengaluru	Principal Member	BIS Safety of Machinery Sectional Committee (ETD-44)
		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
		Life Member	Solar Energy Society of India (SESI)
			Society of Energy Engineers and Managers (SEEM)

		Accredited "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
28.	Yugal Agrawal, Joint Director STDS-CPRI, Bhopal	Member	BIS Sectional Committee ETD-- 47, Electrical Traction Equipments
29.	G. Girija Joint Director CPRI, Bengaluru	Member	BIS Sectional Committee for Environmental Conditions Testing Procedures – LITD-01
30.	Dr. S.K. Nath Joint Director TRC-CPRI, Koradi	Alternate Member	Technical Committee on Thermal Research of Standing Committee on R&D (SCRD) of Min. of Power, Govt. of India
		Member	American Society of Mechanical Engineers (ASME)
		Supervisor for PhD	Rashtrasant Tukadoji Maharaj Nagpur University (RTMNU)
31.	Rajesh Ranjan Joint Director TRC, Koradi	Life Member	Indian Society for Technical Education (ISTE)
32.	K.A. Aravind Joint Director UHVRL-CPRI, Hyderabad	Alternate Member	BIS ETD-19 - High Voltage Engineering
		Member	Institute of Electrical & Electronics Engineers (IEEE)
33.	Dr. P. Chandrasekhar Joint Director CPRI, Bengaluru	Member	National Mission on Power Electronics Technology (NaMPET)
			Bureau of Energy Efficiency (BEE) S&L Program of Refrigerator & AC
34.	Dr. M G Anandakumar Joint Director CPRI, Bengaluru	Life Member	Indian Society of Systems for Science and Engineering, Bengaluru chapter(ISSS)
			Indian Ceramic Society-Bengaluru chapter/Kolkata
			Indian Society of Analytical Scientists-Bengaluru chapter
		Member	Metallurgical Engineers Association-Department of MME, NITK, Surathkal

			Indian Institute of Ceramics, Kolkata (MIICer)
35.	S Pathak Engg. Officer Gr.4 STDS-CPRI, Bhopal	Life Member	Indian Society for Technical Education
36.	U.S.Joshi Engg. Officer Gr.4 TRC-CPRI, Koradi	Member	American Concrete Institute
37.	G. Kishore Kumar Engg. Officer Gr.4 CPRI, Bengaluru	Life Associate Member	Indian Institute of Chemical Engineers, Kolkata.
		Life Time Member	Indian Society of Analytical Scientists, Mumbai.
		Executive Member	Bengaluru Regional Center of IIChE.
		Member	Clay and Stabilized soil products for construction, CED -30 of BIS
			MTD-4, BIS -Flat Steel Products Subcommittee, MTD 4.3
38.	Pradish M Engg. Officer Gr.4 CPRI, Bengaluru	Corporate Member	UCA, IUG, USA
		Member	BIS ETD-13
			BIS ETD-13, Panel 1 & Panel 4
			BIS LITD-10, Panel 1, 2 & 3
			ISGF WG 3: Digital Architecture & Cyber Security
			ISGF-WG-2: IoT Smart Metering, AI & Analytics
			IEEE-SA-PLC Test Bed Group
39.	Dr. Kuldeep Singh Rana Scientific Officer Gr.3 CPRI, Bengaluru	Principal Member	BIS ETD- 10 & 11 for Primary, Secondary Cell and Batteries
		Member	Electro technology in Mobility Sectional Committee, BIS ETD-51
			S&L program for Advanced Chemistry Cell (ACC) & Batteries for electric vehicle, BEE

40.	Dharmesh Yelamanchi Engg. Officer Gr.3 CPRI, Bengaluru	Alternate Member	Sectional Committee, ETD - 06, BIS
			Sectional Committee, ETD - 19, BIS
41.	Dr. Manohar Singh, Engg. Officer Gr.3 CPRI, Bengaluru	Alternate Member	BIS - Wind Turbines Sectional Committee ETD -42
42.	Thirumurthy Engg. Officer Gr.4 CPRI, Bengaluru	Alternate Member	BIS ETD - 09 Power Cables Committee
43.	Priyamvada Chandel Engg. Officer Gr.4 STDS-CPRI, Bhopal	Life Member	ISTE
44.	Dr. P. Rajamani Engg. Officer Gr.3 UHVRL-CPRI, Hyderabad	Life Member	Metrology Society of India, NPL, New Delhi
			Society of Energy Engineers & Managers, Thiruvanathapuram
45.	V. Vaidhyanathan Engg. Officer Gr.3 CPRI, Bengaluru	Principal Member	Power Capacitors Sectional Committee ETD -29 of BIS
		Member	MT-21 "Shunt capacitors for voltages upto and including 1000V for power systems" under IEC/TC 33
			MT-19 "Shunt capacitors for voltages above 1000V for power systems" under IEC/TC 33
46.	Shaileshwari M U Engg. Officer Gr.4 CPRI, Bengaluru	Member	BIS LITD-10, Panel- 2 on security
47.	Venkatesh Engg. Officer Gr.3 CPRI, Bengaluru	Principal Member	BIS ETD-32 Committee for Electrical Appliances
48.	Rajaram Mohanrao Chennu Engg. Officer Gr.3 CPRI, Bengaluru	Member	ETD-16:Transformers
49.	Dillip Kumar Puhan Engg. Officer Gr.3 CPRI, Bengaluru	Member	Standardisation of the Management of Assets in Power Network Sectional Committee, ETD-53, BIS
50.	Dr. Moumita Naskar Scientific Officer Gr.3 Engg. Officer Gr.3 CPRI, Bengaluru	Member	Winding wires Sectional Committee, ETD- 33

51.	K. Vijaya Kumar Engg. Officer Gr.3 CPRI, Bengaluru	Alternate Member	Standing Committee of experts to Investigate Cause of failure of towers , Central Electricity Authority (CEA) / Powergrid, New Delhi
		Member	Committee for Audit of Transmission line tower with respect to design & life of towers, Central Electricity Authority (CEA)/ Powergrid, New Delhi.
52.	Jithin Pauly P Engg. Officer Gr.2 CPRI, Bengaluru	Alternate Member	Sectional Committee BIS ETD-30
			Sectional Committee, ETD-48, BIS
53.	Ashitha P N Engg. Officer Gr. 1 CPRI, Bengaluru	Principal Member	BIS ETD-02, Solid Electrical Insulating Materials and Insulation Systems Sectional Committee
54.	K Jeykishan Kumar Engg. Officer Gr.1 CPRI, Bengaluru	Permanent Member	International Journal of Development and Sustainability (IJDS)
			International Association of Engineers (IAENG)
			International Association of Innovation Professionals (IAOIP)
		Member	SIRFN DER Test Protocol Working Group (WG)
			IEEE P2004/ D2 Working Group (WG)

Appendix – 10

PAPERS PRESENTED / PUBLISHED INDICATING EVENT / VENUE / JOURNAL FOR 2019-20

CAPACITORS DIVISION

1. T. Bhavani Shanker, V. Vaidhyanathan, G. Govinda Rao & A Sheik Mohamed, titled "On-line acoustic emission technique for identification of Relative Condition Generator Transformers in Hydro Power Station-Case studies", at National Conference on "Transformers and Allied Equipment", organised by HPL, CPRI, Bengaluru, at Bengaluru, on 19th & 20th December 2019.

2. V. Vaidhyanathan, T. Bhavani Shanker, titled "A Study on Thermal Behavior of Low Voltage Iron Core Series Reactors Used with Capacitor Bank", at National Conference on "Transformers and Allied Equipment", organised by HPL, CPRI, Bengaluru, at Bengaluru, on 19th & 20th December 2019.

3. V. Vaidhyanathan, T. Bhavani Shanker, titled "Thermal Performance of HV & LV Electrical Equipment", at Seminar on "Thermal Performance of HV & LV Electrical Equipment", held at CPRI STDS, Bhopal, on 20th December 2019.

4. T. Bhavani Shanker, V. Vaidhyanathan, R. Shyam, A. Sheik Mohamed, titled "Periodic Condition Assessment of 220kV Transformers at site by Online Acoustic Emission Technique", at National Conference on "High Voltage Engineering and Technology" (NCHVET-2019), Organized by CPRI, UHVRL, Hyderabad, at UHVRL-CPRI, Hyderabad, on 24th January 2020.

5. V. Vaidhyanathan, T. Bhavani Shanker, titled "Analysis of Dynamic Performance of High Voltage Circuit Breakers in EHV Switchyards", at the International Conference on "Recent Advances in Mechanical Engineering (ICRAME-2020)", Organized by Andhra University College of Engineering, Vishakhapatnam, from 26th to 28th February 2020.

6. T. Bhavani Shanker, V. Vaidhyanathan, R. Shyam & A. Sheik Mohamed, titled "Non- Destructive Testing – Acoustic Emission Technique for online condition Assessment of Generator Transformers", at the International Conference on "Recent Advances in Mechanical Engineering (ICRAME-2020)", Organized by Andhra University College of Engineering, Vishakhapatnam, from 26th to 28th February 2020.

7. V. Vaidhyanathan, Dr.T. Bhavani Shanker, R. Shyam, A. Sheik Mohamed, titled "Challenges Involved in Switching Shunt Power Compensation Banks in LV Distribution Networks & Smart Grids", at National Conference on "LT & HT Switchgears – Smart Technologies", organized by CPRI, STDS, Bhopal, at Bhopal, on 28th & 29th February 2020.

Cables & Diagnostics Division

8. Nageshwar Rao, Burjupati, Kandiban R, Anju R.K, Ashwin Parthasarathy, titled "Low density Polyethylene-clay nano dielectric prepared by melt extrusion process : Dielectric and thermal properties " at 12th International Conference on Electrical Materials and Power Equipment "ICEMPE 2019" held at Guangzhon, China, from 7th to 10th April, 2019.

9. K Karunakara, Ashitha P N, K G Rakesh, titled "Effects of secondary grade core material on the performance of transformers and methods of detection", at 6th International Exhibition and Conference-Grid Tech 2019, organized by POWERGRID at Pragati Maidan, New Delhi, from 3rd to 5th April 2019.

10. Nageshwar Rao, Burjupati, Kandiban R, Ashwin Parthasarathy, titled "Influence of Metal Oxide Nano Particles on the Dielectric Response of HVDC Cable Nano Dielectric", at 37th Electrical Insulation Conference (EIC 2019) held at Calgary, Canada, from 16th to 19th June 2019.

11. Nageshwar Rao, Burjupati, Dillip Kumar Puhan, Rajat Sharma, titled "Opto Electronic Technique for Detection of Corona Discharges in Compressed Gases and Oil", at 37th Electrical Insulation Conference (EIC 2019), held at Calgary, Canada, from 16th to 19th June 2019.

12. Burjupati, Nageshwar Rao, titled "Comparative Study on LLDPE, LDPE Nano Dielectric for application in HVDC cables: Dielectric response, Electrical and Thermal properties", at 10th International Conference on Insulated Power Cables, JICABLE-19, held at Versailles, France, from 23rd to 27th June 2019.

13. Arunjothi R, Thirumurthy, Meena K.P, titled "A Study of Smoke Release of Complete Cables and components of the cables", at 10th International Conference on Insulated Power Cables, JICABLE-19, held at Versailles, France, from 23rd to 27th June 2019.

14. Meena K P, Thirumurthy, Arunjothi R, titled "Effect of air density factors on performance of EHV cable terminations during lightning transients", at 10th International Conference on Insulated Power Cables, JICABLE-19, held at Versailles, France, from 23rd to 27th June 2019.

15. Satheeshkumar P.V., Raja G.K., Meena K.P, titled "Standardization of sample preparation for mechanical tests on cable Insulation and sheathing materials", at 10th International Conference on Insulated power Cables, JICABLE-19 held at Versailles, France, from 23rd to 27th June 2019.

16. Arunjothi R, Thirumurthy, Meena K.P, titled "Comparison of Wavelet, Stationary Wavelet & Wavelet Packet Methods for De-noising of Partial Discharge on Power Cable System", at 21st International Symposium on High Voltage

Engineering (ISH 2019) held at Budaspet, Hungary, from 26th to 30th August 2019 and published in the springer book of series "Lecture Notes in Electrical Engineering", LNEE, Volume 598, page nos. 498-509.

17. Arunjothi R, Thirumurthy, Meena K.P, titled "Pattern Recognition of Partial Discharges on Power Cable Systems", at 21st International Symposium on High Voltage Engineering (ISH 2019) held at Budaspet, Hungary, from 26th to 30th August 2019 and published in the springer book of series "Lecture Notes in Electrical Engineering", LNEE, Volume no.598, page nos.510-520

18. B. Nageshwar Rao, Ashwin Parthasarathy, Kandiban R, titled "Understanding the Role of Metal Oxide Nano Particles in Improving Electrical, Dielectric and Thermal Properties of Polyethylene Nano Dielectric", at 21st International Symposium on High Voltage Engineering (ISH2019) held at Budaspet, Hungary, from 26th to 30th August 2019 and published in the springer book of series "Lecture Notes in Electrical Engineering", LNEE, Volume 599, page 182-193

19. Ashitha PN, Akhil S, K Karunakara, titled "A Study on the effects of Nano fillers in high temperature vulcanized silicone rubber for outdoor Insulation Applications", at 10th International Conference on Electrical & Electronic Insulating Materials & Systems, INSULEC-2019, held at Mumbai, on 21st & 22nd August, 2019.

20. Moumita Naskar, Dharmendra titled "Comparison of Surface tracking behavior of anti-tracking heat shrinkable materials", at International Conference Advances in Polymer Science and Rubber Technology, held at ARSRT, IIT, Kharagpur, from 24th to 27th September 2019.

21. Dillip Kumar Puhan, Rajat Sharma, Kandiban, Nageshwar Rao Burjupati, titled "Application of Optoelectronic Technique for detection of Air Corona, Surface Discharges at Cable Termination and end winding of Stator coil", at 4th IEEE International Conference on "Condition Assessment Techniques in Electrical Systems – CATCON 2019", held at IIT, Chennai, from 21st to 23rd November 2019.

22. Arunjothi R, Thirumurthy, Meena K.P, titled "Impulse Testing of Power Cables – Simulation cum Experimental Approach" in International Journal of Engineering Research & Technology (IJERT), Vol. No.8, Issue No.12, page Nos. 249 -252, December 2019.

23. Dillip Kumar Puhan, Rajat Sharma, K.P.Meena, R.Arunjothi, Thirumurthy, titled "Life Cycle Management of Power Transformers – CPRI Experience", at National Conference on "Transformers and allied Equipment", organized by HPL, CPRI, Bengaluru, at Bengaluru, on 19th & 20th December 2019.

24. R. Arunjothi, Meena. K.P, titled "Induced Sheath Over Voltages on 220 kV Bonded Cable Systems", at National Conference on "Recent Trends in High

Voltage Engineering and Technology (NCHVET 2020), organized by UHVRL, CPRI, Hyderabad, at CPRI, Hyderabad, on 24th January 2020.

25. Moumita Naskar, Dharmendra, titled "Preparation and characterization of EVA nano composite encapsulants used in solar photovoltaic (PV) cell with high electrical, thermal and mechanical properties" , at National Conference on Recent Trends in High Voltage Engineering & Technology (NCHVET 2020), organized by UHVRL, CPRI, Hyderabad, at CPRI, Hyderabad, on 24th January 2020.

Dielectric Materials Division

26. P. Thomas, A. Ashokbabu, R. S. E. Ravindran & R. Vaish, tilted "Dielectric properties of nylon 11/$CaCu_3Ti_4O_{12}$ (CCTO) nanocomposite films with high permittivity", in IEEE Transactions on Dielectrics and Electrical Insulation, Volume No. 26, Issue No. 2, pp. 568-575, April 2019.

27. Ann Pamla Cruze K.S. Lokesh Kaggare, & R.R. Siva Prakash, titled "Oxidation Stability of Insulating Liquids by Rapid Small Scale Oxidation Test", at 20th IEEE International Conference on Dielectric Liquids, held at Roma, Italy, from 23rd to 27th June 2019.

28. Ann Pamla Cruze & K.S. Lokesh Kaggare, titled "Thermal and Dielectric properties of Processed Mahuva oil", at 20th IEEE International Conference on Dielectric liquids, held at Roma, Italy from 23rd to 27th June 2019.

29. A. Ashokbabu & P. Thomas, titled "Structural, thermal and dielectric behavior of Polyaryletherketone (PAEK)/CaCu3Ti4O12 (CCTO) nanocomposite films", in Ceramics International, Volume 45, Issue 18, Part B, 2019, Pages 25052-25059, ISSN 0272-8842, October 2019.

30. P. Thomas, titled "Breakdown Voltage and Gassing Tendency of Synthetic Esters Based MgO Nanofluids", in 4th International Conference on Condition Assessment Techniques in Electrical Systems (CATCON 2019)", held from 21st to 23rd November 2019.

31. P Thomas, & A. Ashok babu, titled "Dielectric and Thermal Behavior of PTFE/ Sr2TiMnO6 (STMO) Composites", in 4th International Conference on Assessment Techniques in Electrical Systems (CATCON 2019)", held from 21st to 23rd November 2019.

32. Dr. P. Thomas A. Ashokbabu, and R. Vaish, titled "Structural, thermal and dielectric properties and thermal degradation kinetics of nylon 11/CaCu3Ti4O12 (CCTO) nanocomposites", Journal of Thermal Analysis and Calorimetry, https://doi.org/10.1007/s10973-019-09105-8, December 2019.

33. P. Thomas, titled **"**Thermal and electrical properties of insulating nanofluids", at Conference on 'Recent Trends in High Voltage Engineering & Technology (NCHVET 2020)', held at UHVRL, CPRI, Hyderabad, on 24th January 2020.

34. P. Thomas, A.Ashokbabu & Nanda, titled "Synthesis and Characterization of Polymethyl methacrylate (PMMA) / Sr_2TiMnO_6 composite prepared by solution cast technique" at International Conference on Advancements in Polymeric Materials", held at CIPET, Bengaluru, from 13th to 15th February, 2020.

35. Venkata Prasad C & Gnanasekaran, titled "Fabrication of Flame Retardant Polymer composite films and its properties "Eco–friendly and cost effective methodology", in 'Seminar on Recent Trends in Electric Wires & Power Cables Technology', organised by CPRI – RTL Noida, at Vigyan Bhawan, New Delhi, on 19th February 2020.

Electrical Appliances Technology Division

36. P. Chandra Sekhar, titled **"**Evaluation of Energy Efficiency Measurements on Home Appliances –Case Studies"**,** at GRIDTECH-2019 Conference/Symposium, organized by POWERGRID, at ITPO Pragati Maidan, New Delhi, on 3rd & 4th April 2019.

37. Shivangi Kosta, R Sneha and Kuldeep Rana, titled "Design, Fabrication and Electrochemical performance of Soluble Lead Redox-Flow Battery for Energy Storage", in IEEE Xplore, (Published on 25 July 2019). DOI: 10.1109/NPSC.2018.8771752.

38. P. Chandra Sekhar, titled "Power Distribution Reliability- Overview in India", at International Conference on Reliability, organized by JNTUA, Anantapuramu, at JNTUA, Anantapuramu, from 11th to 13th December 2019.

39. Kuldeep Rana, "Synthesis and Fabrications of Additive Free Electrode Materials for High Performance Li-ion Battery Technologies: Recent Progress", at 6th International Conference on Heat Treatment and Surface Engineering, organized by IIT-Madras, at Chennai, from 5th to 7th March 2020.

Earthquake Engineering & Vibration Research Centre

40. R. Panneer Selvam, Yamini Gupta & D. Nagesh Babu, titled "Seismic Behaviour of LV Switchgear and Controlgear", at National Conference on "Latest Trends and Developments in Low Voltage Switchgear, Controlgear and Associated Assemblies", organized by Short Circuit Laboratory, CPRI, Bengaluru, at Bengaluru, on 20th September 2019.

41. R. Panneer Selvam, Yamini Gupta & D. Nagesh Babu, titled "Seismic Qualification of Transformers", at Workshop on "Design, Testing and Analysis of Distribution Transformers for Optimal Performance Evaluation", organized by Short Circuit Laboratory, CPRI, Bengaluru, at CPRI, Bengaluru, on 22nd November 2019.

42. R. Panneer Selvam, Yamini Gupta, titled "Seismic Qualification of Transformer Bushing", at National Conference on "Transformers and Allied Equipment", organized by High Voltage Laboratory, CPRI, Bengaluru, at Bengaluru, on 19th & 20th December 2019.

43. R. Panneer Selvam, A.N.N. Nampoothiri, Yamini Gupta & D. Nagesh Babu, titled "Performance of Relays and Protection Equipment under Vibration Environment", in Power Research (Journal of CPRI), Vol. No. 15, Issue No.1, June 2019.

Energy Efficiency & Renewable Energy Division

44. K. Jeykishan Kumar, G. Bharath Kumar and R. Sudhir Kumar, titled "Thermal Issues of Warm and Cool White LED Bulbs", in Power Research (A Journal of CPRI), Vol. No.15, Issue No.1, Page Nos. 58-63, June 2019, ISSN (Print) : 0973-0338.

45. N. Archana Kesarkar, K Jeykishan Kumar & N. Rajkumar titled "Solar Radiation Forecasting for moderate Climatiic Zone" in Power Research (A Journal of CPRI), Vol. No.15, Issue No.1, Page Nos. 52-57, June 2019, ISSN (Print) : 0973-0338.

46. K. Jeykishan Kumar, titled "Photobiological effects of LED" at One day National Seminar cum Workshop on "LED Lighting Systems and Intelligent Lighting", conducted by Energy Efficiency & Renewable Energy Division, CPRI, Bengaluru, at CPRI, Bengaluru, on 29th August 2019.

47. K. Jeykishan Kumar, & R. Sudhir Kumar, titled "Grid loss protection in solar-wind hybrid based utility interactive inverter" in 2nd International Conference on Large Scale Grid integration of Renewable Energy in India, conducted by MNRE and MoP, Govt. of India, in The Lalit Hotel, New Delhi, 4th to 6th September, 2019.

48. N. Ninad, E. Apablaza-Arancibia, M. Bui, J. Johnson, S. Gonzalez, W. Son, C. Cho, J. Hashimoto, K. Otani, R. Bründlinger, R. Ablinger, C. Messner, C. Seitl, Z. Miletic, I. Vidaurrazaga Temez, F.P. Baumgartner, F. Carigiet, B. Fox, R. Sudhir Kumar, K. Jeykishan Kumar, titled "Development and Evaluation of Open-Source IEEE 1547.1 Test Scripts for Improved Solar Integration", in 36th European Photovoltaic International Conference on Solar Energy and Exhibition (PVSEC), held in Marseille, France, from 9th to 13th September 2019.

49. K. Jeykishan Kumar, G Bharath Kumar, Project Associate & R Sudhir Kumar, titled “Harmonic impacts of warm and cool white LED bulbs”, in 2019 IEEE Global International Conference for Advancement in Technology (GCAT), conducted by IEEE, Bengaluru Section, in association with Nagarjuna College of Engineering and Technology, Bengaluru, at Nargarjuna College, Bengaluru, from 18th to 20th October 2019.

50. K. Jeykishan Kumar, titled “India’s EV Charging Infrastructure - An Overview”, in Electrical India Magazine, Vol. No. 58, Issue No.11, Page 168-174, November 2019, ISSN 0972-3277.

51. K. Jeykishan Kumar, titled “Evaluation of Low Voltage Ride-Through (LVRT) performance in grid connected inverters”, at National Seminar on Grid Connected Inverters, held at CPRI, Bengaluru, on 24th January 2020.

52. N. Rajkumar, titled “Energy Audit to Enhance Thermal Power Plant’s performance”, at National Conference on "Role of Energy Efficiency and Renewable Energy in Global Warming Mitigation", held at CSIR-CSIO, Chennai, on 2nd March 2020.

High Voltage Division

53. C Prabhakar, Jithin Pauly, U.R. Sheshagiri Rao, R.A. Deshpande, titled “Validation of Grounding System for a New Test Lab at CPRI”, at National Conference on High Voltage Engineering and Technology - 2020 (NCHVET), organized by UHVRL, CPRI, Hyderabad, at UHVRL-CPRI, Hyderabad, on 24th January 2020.

54. Dharmesh Y, Gobinath G, Vasudev, U.R. Sheshagiri Rao, Giridhar, titled “Tracking & Erosion Performance of Nano- SiR Insulating Materials”, at National Conference on High Voltage Engineering and Technology - 2020 (NCHVET), organized by UHVRL, CPRI, Hyderabad, at UHVRL-CPRI, Hyderabad, on 24th January 2020.

55. Dharmesh Y, Mohan Babu, Dr. Vasudev, U.R. Sheshagiri Rao, Giridhar, titled “Ageing study of Nano – SiR composite Insulators under DC excitation”, at National Conference on High Voltage Engineering and Technology - 2020 (NCHVET), organized by UHVRL, CPRI, Hyderabad, at UHVRL-CPRI, Hyderabad, on 24th January 2020.

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148. G Girija and co-authored by N Maheswara Rao, S Arjuna Rao, Swaraj Kumar Das & R A Deshpande, titled "Temperature Rise Test Assessment on Distribution Transformer", in One Day Workshop on "Design, Testing and Analysis of Distribution Transformers for Optimal Performance Evaluation", held at CPRI, Bengaluru, on 22nd November 2019.

149. S Arjuna Rao and co-authored by Shenbagarajan, C L Prakash, G Girija & Swaraj Kumar Das, titled "Significance of Zero Sequence Impedance & Special Tests", in One Day Workshop on "Design, Testing and Analysis of Distribution Transformers for Optimal Performance Evaluation", held at CPRI, Bengaluru, on 22nd November 2019.

150. N Maheswara Rao and co-authored by B R Vasudevamurthy, Swaraj Kumar Das & R A Deshpande, titled "Solid State Transformer Topologies – A Review", in National Conference on "Transformer and Allied Equipment", held at Bengaluru, on 19th & 20th December 2019.

151. S. Arjuna Rao and co-authored by Rakesh K G, Rama Narayana Reddy, G. Girija, B R Vasudevamurthy, Swaraj Kumar Das & R A Deshpande, titled "Temperature Rise Test on High Voltage Switch Gear and Control Gear –Key Findings & Interpretations", in National Conference on "LT/HT Switchgear & Controlgear - Smart Technologies (Switchcon 2020)", organized by CPRI, STDS, Bhopal, at Bhopal, on 28th & 29th February 2020.

152. S. Arjuna Rao and co-authored by G. Girija, B R Vasudevamurthy, Swaraj Kumar Das & R A Deshpande, titled "Noise Level Measurements in Amorphous & CRGO Core Distribution Transformers", in "Electrical India" magazine, February 2020, issue, Page Nos. 60 to 67.

Switchgear Testing & Development Station, Bhopal

153. T.Prabhakaran ,Saumitra Pathak, Himangshu Roy, Vipul Sharma, Sumbul Munshi, B. M. Mehra, titled "Failure analysis of the oil immersed distribution transformer during short circuit withstand testing", in the International Conference (ICETEEC -2019), organized by REVA University, Bengaluru, at Bengaluru, on 25th & 26th July 2019

154. Yugal Agrawal, titled "Second round of comparison tests for High current shunts in Asia and North America with an STL Reference Shunt", at International Symposium on High Voltage Engineering (21st ISH -2019) held at Brahms, Budapest, Hungary, from 26th to 30th August 2019.

155. Yugal Agrawal & K. Sharath Kumar, titled "Short circuit test on inverter- duty transformer for solar application", in Electrical India Magazine, Vol. No.59, Issue No.5, September 2019.

156. Yugal Agrawal & K. Sharath Kumar, titled "Load Break Switch, Evaluation of Breaking & Making Capabilities", in Electrical India Magazine, Vol. No.59, Issue No.10, October 2019.

157. Surendra Kalambe & Co-authored by B.A. Sawle, titled 'Load Switching Capability Testing of Smart Meters as per IEC: 62052-21", in the National Seminar on "Latest Trends in Smart meter & Prepayment Meter Technologies", held at CPRI, Bhopal, on 15th November 2019.

158. B.A. Sawle, titled "Metering Standards", in the National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies", held at CPRI, Bhopal, on 15th November 2019.

159. Deepa Warudkar & Co-authored by Priyamvada Chandel, titled "Issues during Prepayment and Smart meter testing", in the National Seminar on "Latest Trends in Smart Meter & Prepayment Meter Technologies", held at CPRI, Bhopal, on 15th November 2019.

160. T. Prabhakaran, Saumitra Pathak, Himangshu Roy, Vipul Sharma, Sumbul Munshi, B. M. Mehra , titled "Failure modes of the transformers during short circuit withstand testing in SC A2", in the International Colloquium organized by CBIP, India and CIGRE, India, held at New Delhi, on 21st & 22nd November 2019.

161. Ramjeet Singh, titled "Gaseous Content in Transformer oil and Dissolved Gas Analysis" in the National Conference on "Transformer and Allied Equipment", held at Bengaluru, on 19th & 20th December 2019.

162. Gangadhar Reddy, V. Vaidhyanathan, T. Bhawani Shankar, R. Shyam & A. Sheik Mohamed, titled "Integrated Thermal Performance of LV Power Factor Correction Banks and APFC Panels", in the National Seminar on "Thermal Performance on HV/LV Electricals Equipments', held at CPRI, Bhopal, on 20th December 2019.

163. Leena H. Roy, titled "Thermal Performance of Low Voltage Switchgear and Controlgear Assemblies", in the National Seminar on "Thermal Performance on HV/LV Electricals Equipments' held at CPRI, Bhopal, on 20th December 2019.

164. Manoj Hirani, and Co-authored by Abhishek Verma, & Gangadhar Reddy, titled "Effect of AC Supply Parameters and Constructional Design of HV / LV Switchgear Assemblies", in the National Seminar on "Thermal Performance on HV/LV Electricals Equipments', held at CPRI, Bhopal, on 20th December 2019.

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165. Abhishek Verma, and Co-authored by Leena H. Roy, Sarita Dongre & Adhil Ansari, titled "Eddy Current Losses on Enclosures of Switchgears and Transformers", in the National Seminar on "Thermal Performance on HV/LV Electricals Equipments' held at CPRI, Bhopal, on 20th December 2019.

166. K. Sharat Kumar, titled “Routine test on transformer as per IS: 1180, IS: 2026 & IEC: 60076”, in the National Seminar on “Testing & Certification of Transformer as per IS: 2026/ IEC: 60076”, held at CPRI, Bhopal, on 3rd January 2020.

167. G. Venkateswarlu Kumar, titled “Significance and Methodologies on short circuit testing on Power Transformer with case studies”, in the National Seminar on “Testing & Certification of Transformer as per IS:2026/ IEC: 60076”, held at CPRI, Bhopal, on 3rd January 2020.

168. G. Ravi, titled “Analysis of transformer temperature rise and loss of life presence of harmonic load current”, in the National Seminar on “Testing & Certification of Transformer as per IS: 2026/ IEC: 60076”, held at CPRI, Bhopal, on 3rd January 2020.

169. G. Venkateswarlu and Co Authored by Yugal Agarwal, Manoher Singh Takkher, M.K. Wadhwani & B.M.Mehra, titled “A case study of impulse test conducted on 250MVA single phase auto transformer”, in the National Seminar on “Recent Trends in High Voltage Engineering and Technology (NCHVET)”, held at UHVRL-CPRI, Hyderabad, on 24th January 2020

170. G. Venkateshwarlu and Co Authored by Yugal Agarwal, Manohar Singh Takkher, M.K. Wadhwani & B.M.Mehra, titled “Interpretation of NSDD and restrike in Capacitive Current Switching Test on Medium Voltage Vacuum Circuit Breaker”, in the National Conference on “LT / HT Switchgear & Controlgear – Smart Technologies”, held in Bhopal, on 28th & 29th February 2020

171. K. Sharat Kumar and Co- Authored by Diptiranjan Sahoo, Yugal Agarwal, Manoher Singh Takkher & M.K. Wadhwani, titled “Performances evaluation of circuit breakers under asymmetrical fault condition (Test duty T100a)”, in the National Conference on LT / HT Switchgear & Controlgear – Smart Technologies, held at Bhopal, on 28th & 29th February 2020.

172. K. Prabhakaran and Co-authored by Vipul Sharma, Saumitra Pathak, Himangshu Roy, Sumbul Munshi & B.M. Mehra, titled “Critical issues during breaking capacity tests of the HRC fuses”, in the National Conference on “LT / HT Switchgear & Controlgear – Smart Technologies”, held at Bhopal, on 28th & 29th February 2020.

173. Arun Kumar Datta and Co-authored by Shailesh K. Malganya, Sahil Jain & Vikesh Gautam, titled “Importance of accessing Power Quality Issues and Utilization of Smart Mitigation strategies”, in the National Conference on LT / HT Switchgear & Controlgear – Smart Technologies, held at Bhopal, on 28th & 29th February 2020.

Training Division

174. M G Anandakumar, titled **"**A Study on the Performance of High Emissivity Coating on Refractories for Energy Savings Application" at International Conference on "Recent Advances on Renewable Energy- RARE-2020", organized by National Institute of Technology- NITK, Surathkal along with Government Engineering College (GEC), Jhalawar, at Surathkal, from 7th to 9th February 2020.

Thermal Research Centre, Koradi

175. Dr. S.K.Nath, titled "Reliable Ultrasonic Time of Flight Diffraction (TOFD) based inspection of critical plant components for improved availability", at National Seminar on " Non-Destructive Evaluation (NDE) Based Condition Assessment of Plant Components", held at TRC, Nagpur, on 28th February 2020.

176. Rajesh Ranjan, titled "Analysis and case study on failed components of Thermal Power Plant", at National Seminar on "Non-Destructive Evaluation (NDE) Based Condition Assessment of Plant Components", held at TRC, Nagpur, on 28th February 2020.

177. Rajesh Ranjan, titled "Role of Non-Destructive Evaluation (NDE) in Remnant Life Assessment (RLA) Study of Boilers", at National Seminar on " Non-Destructive Evaluation (NDE) Based Condition Assessment of Plant Components", held at TRC, Nagpur, on 28th February 2020.

178. Dhiraj M Gourkhede, titled "Damage Assessment of Attemperator of Thermal Power Plant Boilers", at National Seminar on "Non-Destructive Evaluation (NDE) Based Condition Assessment of Plant Components", held at TRC, Nagpur, on 28th February 2020.

179. Uday S Joshi, titled "Damage mechanism due to Environmental impact on Reinforced Concrete Structures", at National Seminar on "Non-Destructive Evaluation (NDE) Based Condition Assessment of Plant Components", held at TRC, Nagpur, on 28th February 2020.

180. Rahman Muhammed Faisal, Pradeep .M Nirgude, Burjupati Baleshwar Rao & K P Meena, titled "Partial Discharge Pulse Discrimination of Different Conducting Particles In Transformer Oil Under Uniform Field", in International Symposium on High Voltage Engineering (ISH- 2019), held at Budapest School of High Voltage Engineering, Budapest, Hungary, from 26th to 30th August 2019.

181. Rahman Muhammed Faisal, Pradeep M Nirgude, Burjupati Nageshwar Rao & K Thirumurthy, titled "Effect of Non-Conducting Particle In Transformer Oil Partial Discharge Characteristics", in International Symposium on High Voltage Engineering (ISH 2019), held at Budapest School of High Voltage Engineering, Budapest, Hungary during 26th to 30th August 2019.

182. Rahman Muhammed Faisal, Pradeep M Nirgude, titled "Partial discharge behavior due to irregular shaped copper particles in transformer oil with different moisture content of pressboard barrier under uniform field", in IET Gen. Trans. & Dis., journal, Vol. 13, Issue No.24, p. 5550-5560, 17 December 2019 (DOI: 10.1049/iet-gtd.2019.0382).

183. P. Rajamani, K. A. Aravind, K Sandhya, K Rajeswara Rao, K Urukundu, B Krishna and Pradeep M Nirgude, titled "Partial discharge measurement and dielectric testing of high voltage bushings", at "National Conference on Transformers and allied equipment", held at Bengaluru, on 19th & & 20th December 2019.

184. K Urukundu, K. A. Aravind, Pradeep M Nirgude, Gangeshwar Singh and K Sandhya, titled "Time domain electric field analysis of hybrid AC/DC high voltage transmission line using FEM", at 'National Conference on Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)', held at CPRI, Hyderabad, on 24th January 2020.

185. K. A. Aravind, P Rajamani, B Krishna, K Urukundu, A Ramulu and Pradeep M Nirgude, titled "Measurement of ion current density at ground level near HVDC transmission line", at 'National Conference on Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)', held at CPRI, Hyderabad, on 24th January 2020.

186. P Rajamani, K.A Aravind, K Rajeshwara Rao, K Sandhya and Pradeep M Nirgude, titled "Artificial pollution test on composite insulators intended to be used for HVDC transmission lines by solid layer method", at 'National Conference on Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)', held at CPRI, Hyderabad, on 24th January 2020.

187. P Rajamani, K A Aravind and Pradeep M Nirgude, titled “Experimental study on effect of broken disc insulator on voltage distribution across insulator string”, at ‘National Conference on Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)’, held at CPRI, Hyderabad, on 24th January 2020.

188. K. Sahitya Yadav, M.Prameela, Pradeep M Nirgude, titled “Interpretation of FRA data for diagnosing transformer winding displacement and disformations from Transfer Function Parameters”, at ‘National Conference on Recent Trends in High Voltage Engineering & Technology- 2020 (NCHVET- 2020)’, held at CPRI, Hyderabad, on 24th January 2020.

189. P Rajamani, K. A. Aravind and Pradeep M Nirgude, titled “Combined Voltage Test for on High Voltage Switchgear”, at ‘National Conference on LT/HT Switchgear & Controlgear Smart Technologies (SWITCHCON 2020), held at Bhopal, on 28th & 29th February 2020.

190. Muhammed Faisal Rahman and Pradeep M Nirgude, titled “Irregular-shaped Particle Motion and Charge Transfer Mechanism in Transformer oil Under Varying Field”, at ‘9th IEEE Power India International Conference (PIICON 2020)’, held at Deenbandhu Chhotu Ram University of Science & Technology, Murthal, Haryana, from 28th February to 1st March 2020.

Appendix – 11

M.A. NARASIMHAN & CO.,
Chartered Accountants

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E-mail : manco@mancoca.com / mancoca@gmail.com
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No. 25, (Old No. 13), 1st Floor, 7th Cross, Swimming Pool Extension
Malleswaram, Bengaluru-560 003.

INDEPENDENT AUDITOR'S REPORT

To,
The Governing Council
Central Power Research institute
Bangalore.

Report on the Financial statements

Opinion

We have audited the accompanying financial statement **of CENTRAL POWER REASEARCH INSTITUTE** ("the Institute"), which comprise the balance sheet as at March 31,2020, the Income and Expenditure Account for the year then ended of the institute for the year thereto and a summary of significant accounting policies and other explanatory information.

In our opinion, except for the effect on the financial statements of the matters described in the basis for **Qualified Opinion** paragraph, the financial statements have been properly prepared.

a. In the case of the Balance sheet, of the state of the affairs of the Institute as at March 31,2020. 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.

Basis of Qualified Opinion

We conducted our audit in accordance with the Standards on Auditing (SAs). Our responsibilities under those Standards are further described in the Auditor's Responsibilities for the Audit of the Financial Statements section of our report. We are independent of the Company in accordance with the Code of Ethics issued by the Institute of Chartered Accountants of India together with the ethical requirements that are relevant to our audit of the financial statements and we have fulfilled our other ethical responsibilities in accordance with these requirements and the Code of Ethics. We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our **Qualified opinion**.

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

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M.A. NARASIMHAN & CO.,
Chartered Accountants

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No. 25, (Old No. 13), 1st Floor, 7th Cross, Swimming Pool Extension
Malleswaram, Bengaluru-560 003.

Emphasis of Matter Paragraph

a) The capitalizations of Assets with respect to Civil Works are based on the Approval of the Additional Director of the Institute. A work completion certificate certified by external expert is not furnished to us for verification and qualification of the same.

Responsibility Management and those charged with Governance 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 for the Financial Statement

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 (ICAI).

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.

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 assessments of the risks of material misstatement of the financial statements whether due to fraud or error. In

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M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003475 Bangalore Chartered Accountants

M.A. NARASIMHAN & CO.,
Chartered Accountants

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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 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 of the Financial Statements.

For **M.A.NARASIMHAN & CO.,**
Chartered accountants
ICAI Firm Regn. No.002347S

(M.A Parthanarayan)
Partner
Membership No: **028994**
UDIN: 20028994AAAADG8670

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 002347S Bangalore Chartered Accountants

Place: Bengaluru
Date:21-08-2020

CENTRAL POWER RESEARCH INSTITUE, BANGALORE.

BALANCE SHEET AS AT 31ST MARCH 2020

(Amount in Rs.)

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	1192,11,06,283	1055,56,60,633
Reserves and Surplus	2	104,20,15,616	63,88,83,226
Earmarked and Endowment Funds	3	1003,06,60,628	967,63,86,673
Grants from Government of India	4	97,36,20,503	40,45,02,394
Current Liabilities and Provisions	5	110,25,71,089	84,55,79,924
TOTAL		**2506,99,74,117**	**2212,10,12,850**
Assets			
Fixed Assets	6	1161,71,06,282	1025,16,60,633
Investments from Earmarked & Endowment Funds	7	917,24,40,462	631,08,60,141
Current Assets, Loans and Advances	8	428,04,27,373	555,84,92,076
TOTAL		**2506,99,74,117**	**2212,10,12,850**
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 M.A. NARASIMHAN & CO.,
Chartered Accountants
FRN-002347S

(M.A.Parthasarayan)
Partner
Membership No. 028994

Bangalore
21-08-2020

(C.S. Murali Krishna)
Chief Accounts Officer

(V.S Nandakumar)
Director General

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2020

(Amount in Rs.)

INCOME	Schedule	Current Year	Previous Year
Income from Test Fee & Consultancy	9	146,64,67,588	175,80,83,325
Fees	10	1,93,46,003	2,47,87,232
Interest Earned	11	11,01,82,246	25,15,01,994
Other Income	12	47,75,139	1,05,39,679
TOTAL (A)		**160,07,70,976**	**204,49,12,230**
EXPENDITURE			
Research Establishment Expenses	13	94,64,95,636	127,37,25,936
Research Administrative Expenses	14	73,52,66,809	53,82,90,399
Depreciation	15	-22,57,69,040	19,96,70,655
TOTAL (B)		**145,59,93,405**	**201,16,86,990**
Balance being excess of Income over Expenditure (A-B)		14,47,77,571	3,32,25,240
Add:			
Opening Balance of General Reserve Account		2,60,76,612	1,01,01,814
Less:			
Assets directly acquired out of General Reserve		76,65,573	27,20,276
Assets (Non Plan) acquired transferred to Capital Reserve		1,95,63,322	1,45,30,165
CLOSING BALANCE OF GENERAL RESERVE		**14,36,25,289**	**2,60,76,612**
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 M.A. NARASIMHAN & CO.,
Chartered Accountants
FRN-002347S

Bangalore (C.S. Murali Krishna)
21-08-2020 Chief Accounts Officer

(V.S Nandakumar)
Director General

(M.A. Partha narayan)
Partner
Membership No. 028994

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 002347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

	SCHEDULE - 1	Current Year		Previous Year	
	CAPITAL RESERVE REPRESENTING ASSETS ACQUIRED FROM GRANT-IN-AID FROM GOVT. OF INDIA AND INTERNAL RESOURCES				
a)	Under Non-recurring Grant-in aid	912,93,17,842		831,05,14,602	
	Addition during the year	112,71,17,119		81,88,03,240	
			1025,64,34,961		912,93,17,842
b)	Under Non-recurring Grant-in aid (For M/s. NHPTL Equity Capital)	24,00,00,000		24,00,00,000	
	Addition during the year	-	24,00,00,000	-	24,00,00,000
c)	Under R&D Schemes	33,28,85,096		30,10,97,866	
	Addition during the year	322,20,577	36,51,05,673	3,17,87,230	33,28,85,096
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)		1086,39,44,744		970,46,07,048
	ASSETS ACQUIRED FROM INTERNAL RESOURCES				
e)	Under Non-recurring Grant-in aid (CPRI's 10% Contribn.)	17,78,73,227		10,97,55,040	
	Addition during the year	7,85,46,891	25,64,20,118	6,81,18,187	17,78,73,227
f)	Under Revenue	22,76,68,786		21,31,38,621	
	Addition during the year	1,95,63,322	24,72,32,109	1,45,30,165	22,76,68,786
g)	Under Revenue (Equity Participation)	6,40,00,000		6,40,00,000	
	Addition during the year	-	6,40,00,000	-	6,40,00,000
h)	Assets Acquired out of General Reserve	7,60,85,531		7,33,65,255	
	Addition during the year	76,65,573	8,37,51,104	27,20,276	7,60,85,531
i)	Assets Acquired out of Sponsored Schemes	25,10,18,449		22,19,58,138	
	Addition during the year	10,03,32,168	35,13,50,617	2,90,60,311	25,10,18,449
j)	Capitalisation of Assets acquired out of Loan		4,89,94,808		4,89,94,808
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)		1,05,71,61,539		85,10,53,585
	TOTAL (A+B)		**11,92,11,06,283**		**10,55,56,60,633**

Place : Bangalore,
Date 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

	SCHEDULE 2	Current Year		Previous Year	
	RESERVES AND SURPLUS				
A	**GENERAL RESERVE**				
	As per last Account	2,60,76,612		1,01,01,814	
	Add: Surplus during the year	14,47,77,569		3,32,25,239	
	Less: Assets directly acquired out of General Reserve	76,65,573		27,20,276	
	Less: Assets (Non Plan) acquired transferred to Capital Reserve	1,95,63,322		1,45,30,165	
	Net Balance A		**14,36,25,286**		**2,60,76,612**
B	**Reserve for Capital Expenditure out of CPRI generated funds**				
	Opening Balance	54,71,26,773		41,52,44,960	
	Add: Provision / contribution made during the year 2019-20	37,70,00,000		20,00,00,000	
	Less: Utilisation during the year	7,85,46,891		6,81,18,187	
	Net Balance B		**84,55,79,882**		**54,71,26,773**
C	**MAINTENANCE, RENEWAL & OBSOLESCENCE RESERVE**				
	Opening Balance	6,56,79,841		6,23,86,215	
	Add: Interest earned, Loan from HO & accrued during the year	39,70,634		38,95,000	
	Add: Security Deposit	6,11,843		4,33,337	
	Less: Statutory Liabilities	6,91,513		2,25,938	
	Less: Utilisation during the year	1,67,60,358		8,08,773	
	Net Balance B		**5,28,10,449**		**6,56,79,841**
	TOTAL (A+B)		**104,20,15,616**		**63,88,83,226**

Place : Bangalore,
Date: 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

	SCHEDULE 3:	Current Year		Previous Year		
	EARMARKED & ENDOWMENT FUNDS:					
A	**SUPERANNUATION FUND**					
	Opening Balance	658,35,80,501		583,39,19,222		
	Add: Receipts from other organisations	-		-		
	Add: Contribution during the year	35,00,00,000		68,00,00,000		
	Add: Interest earned	44,26,21,889		39,62,35,069		
	Less: Utilisation for Pension payments	36,43,95,135		32,65,73,790		
	Sub Total	**701,18,07,255**		**658,35,80,501**		
	Add: Security Deposit	12,57,010		9,52,717		
	Add: Pension Payable /Others	-		1,270		
	Add: Medical Expenses reimburseable to CPRI	116,27,898		-		
	Add: Maturity Payable to CPRI	1,76,85,000		-		
	Net Balance - A		**704,23,77,163**			**658,45,34,488**
B	**PROVIDENT FUND**					
	Opening Balance	36,98,01,711		37,71,40,410		
	Add: Transfer from Other Organisation	-		-		
	Add: Subscriptions & Repayments	7,51,75,628		6,81,92,996		
	Add: Interest Paid / Credited to PF subscribers	2,78,40,573		2,85,53,095		
	Less: Withdrawals	7,84,42,719		10,40,84,790		
	Sub Total	**39,43,75,193**		**36,98,01,711**		
	Add: Balances under Security Deposit etc.,	958		958		
	Opening Balance (Additional Interest)	3,62,65,505		2,65,43,230		
	Add: Additional Interest earned (Excess of Interest Paid / over interest earned Rs 3,20,06,570-Rs.2,78,40,573)	41,65,997		97,22,275		
	Total	4,04,31,503		3,62,65,505		
	Net Balance - B		**43,48,07,653**			**40,60,68,174**
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)	13,869		8,290		
	(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)	13,869		8,290		
	Sub Total	77,577		66,419		
	Add: Additional Interest earned	1,71,496		1,74,280		
	Add: Balances under Security Deposit etc.,	16,782		16,782		
	Net Balance - C		**2,65,855**			**2,57,481**
D	**DEPRECIATION FUND**					
	Transfer from Depreciation Reserve	244,94,12,137		224,97,41,483	*	
	Less: Revised Depreciation upto 01.04.2019	-48,43,57,224				
	Add: Depreciation During the year	25,85,88,184		19,96,70,654	*	
	Sub Total	222,36,43,097				
	Add: Interest received	8,37,36,655		-		
	Add: Interest accrued	7,99,34,878		-		
	Less: Utilization During the year	-		-		
			238,73,14,630			**244,94,12,137**
E	**OTHER FUNDS**					
	(i) Sponsored Scheme Deposits		9,31,86,382			15,14,68,544
	(ii) IHRD Scheme Deposits		7,27,08,945			8,46,45,849
	TOTAL (A+B+C+D+E)		**1003,06,60,628**			**967,63,86,693**

* Depreciation Reserve balance as on 31.03.2019 has been converted into Depreciaiton Fund as on 01.04.2019. However, for comparision purpose figures have been disclosed here .

Place: Bangalore
Date: 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003475 Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

		SCHEDULE 4	Current Year		Previous Year	
		GRANTS FROM GOVT. OF INDIA, & OTHERS				
A		Under Non-recurring Grant-in aid				
		Opening Balance	25,80,25,406		38,34,28,646	
		Add: Grant received during the year	178,00,00,000		69,34,00,000	
		Less: Grant utilised during the year	112,71,17,119		81,88,03,240	
		Grant Balance		91,09,08,287		25,80,25,406
B		Under R&D Scheme				
		Opening Balance	7,44,30,847		71,37,847	
		Add: Grant received during the year	0		10,70,07,000	
		Less: Grant utilised during the year	2,80,08,000		3,97,14,000	
		Grant Balance		4,64,22,847		744,30,847
C		Under RSoP Scheme				
		Opening Balance	70,74,626		0	
		Add: Grant received during the year	2,45,75,766		7,09,66,000	
		Less: Grant utilised during the year	3,12,64,347		6,38,91,374	
		Less: Grant refunded to M o P during the year	3,86,045		-	
		Grant Balance		-		70,74,626
D		Under NPP Scheme				
		Opening Balance	6,49,71,515		4,48,90,515	
	i)	Add: Grant received during the year*	-2,45,75,766		7,20,27,000	
		Less: Grant utilised during the year	1,43,48,380		5,19,46,000	
		Less: Grant refunded to M o P during the year	97,58,000		-	
		Grant Balance		1,62,89,369		6,49,71,515
		TOTAL		**97,36,20,503**		**40,45,02,394**

* Transfer of Grants from NPP to RSOP scheme since it is permitted.

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

Place : Bangalore,

Date : 21-08-2020

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

		SCHEDULE 5	Current Year		Previous Year	
		CURRENT LIABILITIES AND PROVISIONS				
		CURRENT LIABILITIES				
	1	**Sundry Creditors**				
		a) For Supplies & Services	1,45,65,186		61,32,795	
		b) For Expenses	2,75,10,699		1,60,66,913	
		c) For Salaries	4,68,36,426		4,95,96,045	
		d) For Others	5,54,74,750		4,58,36,775	
		e) Interest received on Grant Account to be refunded to M o P	4,04,18,986		14,46,603	
				18,48,06,047		11,90,79,131
	2	**Deposits Received**		73,41,46,384		54,38,17,906
	3	**Statutory Liabilities**		3,60,78,154		1,46,38,277
	4	**EMD, Security Deposits and others**		14,75,40,504		11,14,89,885
	5	**Reserve for Doubtful debts**		-		5,65,54,725
		TOTAL		**110,25,71,089**		**84,55,79,924**

Place: Bangalore,

Date : 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003475 Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

	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 (CPRI)	Transfer from WIP (MOP)	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	110,99,14,741	76,65,573	-	2,61,77,797	5,16,99,882	119,54,57,993	110,99,14,741
3	PLANT MACHINERY & EQUIPMENT	644,22,84,474	1,76,51,509	3,22,20,577	8,53,94,471	34,44,55,238	692,20,06,269	644,22,84,474
4	VEHICLES	55,81,762	-	-		-	55,81,762.00	55,81,762
5	FURNITURE, FIXTURES	3,02,82,222	19,11,813	-	27,542	6,33,866	3,28,55,443	3,02,82,222
6	LIBRARY BOOKS & FILM	1,55,45,927	-	-		-	1,55,45,927	1,55,45,927
7	MACHNERY & EQUIPMENTS (SPONSERED PROJECTS)	25,10,18,448	10,03,32,168	-		-	35,13,50,616	25,10,18,448
	TOTAL	**792,43,12,434**	**12,75,61,063**	**3,22,20,577**	**11,15,99,810**	**39,67,88,986**	**859,24,82,869**	**792,43,12,434**
B	CAPITAL WORK-IN-PROGRESS	214,94,74,971	112,71,17,119			(39,67,88,986)	287,98,03,104	214,94,74,971
	CAPITAL WORK-IN-PROGRESS (CPRI GRANT PORTION)	17,78,73,227	7,85,46,891		(11,15,99,810)		14,48,20,308	17,78,73,227
	GRAND TOTAL	**1025,16,60,632**	**133,32,25,073**	**3,22,20,577**	-	-	**1161,71,06,282**	**1025,16,60,632**

Place : Bangalore,
Date 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs

	SCHEDULE 7	Current Year	Previous Year
	INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
A	**SUPERANNUATION FUND INVESTMENT ACCOUNT**		
	1 Investment in LIC of India, under Superannuation Scheme	661,85,26,488	586,56,73,325
	2 TDS & Claims Receivables	2,24,87,364	2,24,87,364
	3 Cash at Bank (S.B. Account No.10356553751)	5,13,63,312	1,63,73,799
	Total - A	**669,23,77,164**	**590,45,34,488**
B	**PROVIDENT FUND INVESTMENT ACCOUNT**		
	1 In Government Securities	3,64,92,938	3,64,92,938
	2 Bonds	26,00,00,000	26,00,00,000
	3 Term Deposits with Banks & Financial Institutions	11,50,00,000	9,25,00,000
	4 Interest Accrued on Provident Fund Investments	70,15,946	86,47,660
	5 TDS Receivables	70,85,366	50,05,366
	6 Cash at Bank (S.B. Account No.10356553740)	92,13,403	34,22,210
	Total - B	**43,48,07,653**	**40,60,68,174**
C	**NEW PENSION SCHEME FUND INVESTMENT ACCOUNT**		
	1 Deposit with Bank	2,65,854	2,57,481
	Total - C	**2,65,854**	**2,57,481**
D	**DEPRECIATION FUND INVESTMENT ACCOUNT**		
	1 Term Deposits with Banks & Financial Institutions	6,75,54,914	-
	2 Bonds	189,75,00,000	
	3 Interest Accrued on Depreciation Fund Investments	7,99,34,878	
		2,04,49,89,792	**-**
	Total (A+B+C+D)	**917,24,40,462**	**631,08,60,143**

Place : Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2020

(Amount in Rs.)

		SCHEDULE 8	Current Year		Previous Year	
		CURRENT ASSETS, INVESTMENTS, LOANS & ADVANCES				
A		**CURRENT ASSETS:**				
	1	**Inventories:**				
		a) Stores and Spares		10,88,881		13,99,364
	2	**Sundry Debtors:**				
		a) Debts Outstanding for a period exceeding six months	17,43,68,319		22,89,59,585	
		b) Debts Outstanding for a period not exceeding six months	16,93,60,194	34,37,28,513	16,10,16,041	38,99,75,626
	3	**Cash balances in hand (including cheques/drafts, Imprest and Stamps)**		2,54,875		2,22,543
	4	**Deposits and Bank Balances:**				
		a) Margin Money Deposits on R&D, SPON & Revenue	68,65,000		3,40,60,200	
		b) Margin Money Deposits on Grant account	79,51,98,194		18,26,66,187	
		c) Deposits earmarked for Superannuation Fund	35,00,00,000		68,00,00,000	
		d) Deposits earmarked for Depreciation Fund	25,85,88,184			
		e) Interest Payable to Dep. Fund	8,37,36,655			
		f) Savings Accounts	29,74,10,390	179,17,98,423	34,05,24,334	123,72,50,721
	5	**Deposits of Maintenance, Renewal & Obsolescence Reserve**	1,50,00,000		6,25,00,000	
		Add: Savings Bank account of Maintenance, Renewal & Obsolescence Reserve	4,97,746		19,80,655	
		Add: Maturity to be received from CPRI	429,84,022			
		Add: Accrued interest on MRO Fund & TDS Receivable, etc.,	11,86,901	5,96,68,669	11,99,187	6,56,79,842
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		3040,00,000	
		Add: Amount paid for allotment of Additional Shares	-	30,40,00,000	-	30,40,00,000
		b) Long Term & Short Term Investments				
		Margin Money with Banks against BG	4,95,12,495		870,19,704	
		Bonds	-		211,50,00,000	
		Short Term Deposits with Banks	71,08,21,902	76,03,34,397	39,05,00,000	259,25,19,704
C		**LOANS, ADVANCES & OTHER ASSETS**				
		a) Deposits with Govt.Depts & others	8,21,22,586		8,02,18,755	
		b) Advances to Employees	25,55,496		49,59,762	
		c) Prepaid Expences	6,25,477		6,16,822	
		d) Accrued interest	8,47,23,494		21,84,59,285	
		e) TDS Receivables	69,93,96,763		59,44,95,644	
		f) Claims Receivables	8,19,23,382		9,02,450	
		g) Capital Advances	4,94,190		92,837	
		h) Other Advances	77,02,226		76,98,723	
		i) Loan to NHPTL	6,00,00,000	101,95,53,615	6,00,00,000	96,74,44,278
		TOTAL		**428,04,27,373**		**555,84,92,078**

Place Bangalore,
Date 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 002347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 9	Current Year	Previous Year
	INCOME FROM TEST FEE & CONSULTANCY		
a)	**Test Fee**	127,97,50,508	157,18,92,854
b)	**Consultancy Services Charges**	18,67,17,080	18,61,90,471
	TOTAL	**146,64,67,588**	**175,80,83,325**

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

Place : Bangalore,
Date : 21-08-2020

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 10	Current Year	Previous Year
	FEES		
a)	**Training Fee**	102,10,000	102,55,159
b)	**Seminar Fee**	91,36,003	145,32,073
	TOTAL	**1,93,46,003**	**2,47,87,232**

Place : Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 11	Current Year	Previous Year
	INTEREST EARNED		
a)	**Interest on Term Deposits with Banks & Financial Institutions**	10,92,96,091	24,94,84,581
b)	**Interest on Loans & Advances to Employees**	8,86,155	20,17,413
	TOTAL	**11,01,82,246**	**25,15,01,994**

Place : Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & CO. * Chartered Accountants * ICAI Firm Reg. No. 003347S Bangalore

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

		SCHEDULE 12	Current Year	Previous Year
		OTHER INCOME		
1)		**Fees for Miscellaneous Services**		
	a)	Sale of Publications	4,000	-
	b)	Library Receipts	150	5,150
2)		**Miscellaneous Income**		
	a)	Application fee on recruitment	3,400	23,88,320
	b)	Sale of Tender forms	2,49,961	4,67,368
	c)	Licence fees	20,90,778	22,29,070
	d)	Rent Receipts	17,38,390	22,25,694
	e)	Sale of Scrap	1,31,630	6,18,300
	f)	Others	5,56,830	26,05,777
		TOTAL	**47,75,139**	**1,05,39,679**

Place : Bangalore,
Date 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 13	Current Year	Previous Year
	RESEARCH ESTABLISHMENT EXPENSES		
a)	Salaries and Wages including Bonus	55,76,94,817	54,08,25,244
b)	Staff Welfare Expenses	2,54,36,244	2,94,56,547
c)	Expenses on Employee's Retirement and Terminal Benefits	35,00,00,000	68,00,00,000
d)	Expenses on Medical Facilities	1,33,64,575	2,34,44,145
	TOTAL	**94,64,95,636**	**127,37,25,936**

Place: Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & CO., ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 14	Current Year	Previous Year
	RESEARCH ADMINISTRATIVE EXPENSES		
a)	Electricity and Power	8,39,00,693	8,09,04,788
b)	Water Charges	7,35,298	11,48,758
c)	Office Expenses	5,21,76,279	5,24,16,493
d)	Repairs and Maintenance	18,62,14,336	16,94,78,357
e)	Rent, Rates and Taxes	10,94,648	10,05,026
f)	Vehicles Running and Maintenance Expenses	12,96,917	14,85,104
g)	Postage, Telephone and Communication Charges	25,24,281	25,85,009
h)	Printing and Stationary	28,53,932	7,48,212
i)	Travelling and Conveyance Expenses	1,21,58,010	1,23,51,524
j)	Expenses on Seminar & Workshops	81,88,918	1,04,88,118
k)	Subscription Expenses	82,678	83,275
l)	Expenses on Fees	25,768	1,00,243
m)	Auditors Remuneration	1,45,000	1,75,000
n)	Professional Charges	13,46,485	17,20,835
o)	Library Expenses	34,08,794	43,64,327
p)	Training Expences	6,33,296	12,30,769
q)	Publication Expenses	33,000	1,98,600
r)	Advertisement and Publicity	40,06,892	41,12,109
s)	Research & Development Expenses	0	0
s)	Provision for Doubtful Debts Realised	-25,58,415	-63,06,148
t)	Transfer to 'Reserve for Capital Expenditure' during financial year 2018-19	37,70,00,000	20,00,00,000
	TOTAL	**73,52,66,809**	**53,82,90,399**

Place: Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003479 Bangalore Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2020

(Amount in Rs.)

	SCHEDULE 15	Current Year	Previous Year
	DEPRECIATION		
a)	**Depreciation for the year**	25,85,88,184	19,96,70,655
b)	**Revised Depreciation**	(4843,57,224)	-
	TOTAL	**-2257,69,040**	**19,96,70,655**

Place : Bangalore,
Date : 21-08-2020

M.A. NARASIMHAN & Co
ICAI Firm Reg. No. 002347S Bangalore
Chartered Accountants

CENTRAL POWER RESEARCH INSTITUTE

Schedule forming part of Income & Expenditure for the year ended 31st MARCH 2020

SCHEDULE 16
DEPRECIATION

YEAR	GROSS BLOCK				DEPRECIATION						NET BLOCK	
	OB	Additions		TOTAL	%	OB not Charged to I&E	OB Charged to I&E	For the Year	Total charegd to I&E	Total	OB	CB
		Additions	Transfer from W-I-P to Assets									
1	2	3	4	5		6	7	8	9	10	11	12
				(2+3+4)					(7+8)	(6+9)	(2-6-7)	(5-10)
Land	6,96,84,860	-		6,96,84,860							6,96,84,860	6,96,84,860
Buildings	1,10,56,34,774	76,65,573	7,78,77,679	1,19,11,78,026	3.17	21,46,07,660	24,15,55,428	3,53,34,900	27,68,90,328	49,14,97,988	86,40,79,345	69,96,80,037
Buildings (ICICI)	42,79,967		-	42,79,967	3.17	3,58,374	13,56,750	1,35,675	14,92,424	18,50,798	29,23,217	24,29,169
Plant & Machinery	6,39,75,69,633	4,98,72,086	42,98,49,709	6,87,72,91,428	3.17	1,52,93,55,831	1,63,82,15,235	21,06,52,049	1,84,88,67,284	3,37,82,23,115	4,75,93,54,399	3,49,90,68,313
Plant & Machinery (ICICI)	4,47,14,841	-	-	4,47,14,841	3.17	55,59,645	1,41,62,836	14,17,460	1,55,80,296	2,11,39,941	3,05,52,005	2,35,74,900
Plant & Machinery (Spons)	25,10,18,449	10,03,32,168	-	35,13,50,617	3.17	2,73,85,799	4,29,78,527	92,91,690	5,22,70,217	7,96,56,016	20,80,39,922	27,16,94,601
Furniture & Fixtures	3,02,82,222	19,11,813	6,61,408	3,28,55,443	6.33	67,23,812	1,05,55,298	17,14,476	1,22,69,774	1,89,93,586	1,97,26,924	1,38,61,857
Vehicles	55,81,762	-	-	55,81,762	9.50	34,40,892	14,62,210	41,935	15,04,145	49,45,037	41,19,552	6,36,725
Library Books	1,53,20,774	-	-	1,53,20,774	95.00	-	1,45,54,735	-	1,45,54,735	1,45,54,735	7,66,039	7,66,039
Films (docmntry)	2,25,153	-	-	2,25,153	95.00	-	2,13,895	-	2,13,895	2,13,895	11,258	11,258
Sub Total	7,92,43,12,435	15,97,81,640	50,83,88,796	8,59,24,82,871		1,78,74,32,013	1,96,50,54,914	25,85,88,184	2,22,36,43,098	4,01,10,75,111	5,95,92,57,521	4,58,14,07,759

SCHEDULE 16A
Work-in-Progress

Work-in-Progress	Opening WIP	Addition	Transfer to WIP	Closing WIP
Capital Works in Progress (M o P)	2,14,94,74,971	1,12,71,17,119	(39,67,88,986)	2,87,98,03,105
Capital W-I-P (CPRI)	17,78,73,227	7,85,46,891	(11,15,99,810)	14,48,20,308
Total (B)	**2,32,73,48,198**	**1,20,56,64,011**	**(50,83,88,796)**	**3,02,46,23,413**
TOTAL	**10,25,16,60,633**		-	**11,61,71,06,284**

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

Place: Bangalore,
Date : 21-08-2020

Schedule – 16

Significant Accounting Policies attached to and forming part of Accounts for the year ended 31st March 2020.

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.

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 2019 is of the order of Rs.245,21,89,649/- (for assets additions from 1981) as stated in the Annual Accounts upto 31-03-2019. The useful life was taken for Buildings at 28 years and Plant & Machinery at 20 years. A review of useful life of assets was made. As per the approved project proposals for creation of Capital Assets, the project period is taken at 30 years. Therefore for depreciation, the useful life of Buildings and Plant & Machinery is taken at 30 years and hence depreciation not provided worked out to Rs.1,78,74,32,013/-. Accordingly depreciation for the year 2019-20 is also charged at the revised rates.

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. **Depreciation Fund**:

As per direction from Governing Council, Depreciation fund is created as on 01-04-2019. The interest earned/accrued is added to the fund. Current year depreciation also was provided and added to fund.

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

5. **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.

6. **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.

7. **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.

8. **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.

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

9. **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:

Pension payments are accounted for April to March every year.

As per our report of even date
for M.A NARASHIMAN & CO.,
Chartered Accountants,
FRN 002347S

(C.S.MURALI KRISHNA)	**(V.S. NANDAKUMAR)**	**(PARTHA NARAYANA)**
Chief Accounts Officer	**Director General**	**Partner**
		Membership No.028994

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 002347S Bangalore Chartered Accountants

Place: Bangalore,
Date: 21-08-2020.

Schedule – 17

Notes on Accounts & Contingent Liability attached to and forming part of Accounts for the year ended 31st March 2020.

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.167.60 lakhs for 2019-20 (Rs.8.09 lakhs for the previous year) and Rs.1428.54 lakhs up to 2019-20.

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.

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 31-03-2020 is Rs.84.56 crores.

   (b) National High Power Test Laboratory Pvt. Ltd. is a Joint Venture of NTPC, NHPC, Power Grid, DVC and CPRI. The total equity of NHPTL is Rs. 152.00 Crores, contributed equally by JV Partners of Rs. 30.40 Crores each.

CPRI had contributed the amount by obtaining Plan Grant of Rs. 24.00 Crores from MoP and the balance of Rs. 6.40 Crores was contributed from Internal Resources. M/s. N.H.P.T.L. requested to provide temporary loan of Rs.6.00 Crores 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. Later on as NHPTL had requested for extension of the temporary loan for another 3 months as they were in the process of negotiating larger loan from Banks and Financial Institutions vide their letter No. NHPTL_F&A/019 dated 14.06.2018. The extension of period for temporary loan was obtained from MoP vide letter no. 31-4/1/2018- T&R dated 26.06.2018. The temporary loan is still not settled by M/s NHPTL since NHPTL has requested to provide additional loan of Rs. 12.40 Crores from each JV Partner. CPRI is receiving simple interest @ 10% p.a. on the temporary loan amount.

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 31.03.2020 through M/s Trans Value Consultants (Actuaries and Financial Consultants) and the liability has been estimated at Rs. 73,751.87 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.7,133.80 lakhs was required to be provided. However considering available surplus, a sum of Rs.3,500.00 lakhs has been charged to Income & Expenditure Account during the current year. The cash of Rs.3,500.00 lakhs will be transferred to Superannuation Fund during the financial year 2020-21.

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 003347S Bangalore Chartered Accountants

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. Hon'ble 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.

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.8,712.74 lakhs from Assessment Years 2003-2004 to 2019-2020. An amount of Rs.1,191.03 lakhs has been refunded by Income Tax Department leaving the balance of Rs.7,521.71 lakhs

Sl. No.	A.Y.	Issue and status of the of the cases as on 31.03.2020
1	2011-12 2012-13 2013-14	Appeal was filed with ITAT, "C" Bench and the appeal was party allowed vide order dated 13.10.2017. The case is pending with Assessing Officer
2	2014-15	Appeal was files with CIT(A)-14 and a personal hearing was attended on 31.01.2019 and awaited for order from the CIT(A)-14

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 24.4.2014 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 Sadashivanagar Police Station on 20th Oct. 2016. The matter is still pending.

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 2018-19).

b) Estimated amount of liability on account of capital contracts - Rs.21,972.54 lakhs. (Rs.5087.80 lakhs for 2018-19).

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.147.23 lakhs as on 31.03.2020 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 Institute has a system of Internal Audit conducted by a firm of Chartered Accountants.

11. 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 31.03.2020 are Rs.8346.63 lakhs (Rs.1826.66 lakhs as on 31.03.2019).

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

13. 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 M.A NARASHIMAN & CO.,
Chartered Accountants,
FRN 002347S

(C.S.MURALI KRISHNA)
Chief Accounts Officer

(V.S. NANDAKUMAR)
Director General

(PARTHA NARAYAN)
Partner
Membership No.028994

M.A. NARASIMHAN & CO. ICAI Firm Reg. No. 002347S Bangalore Chartered Accountants

Place: Bangalore,
Date: 21-08-2020.