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CENTRAL POWER RESEARCH INSTITUTE

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ANNUAL REPORT 2016-17

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CENTRAL POWER RESEARCH INSTITUTE

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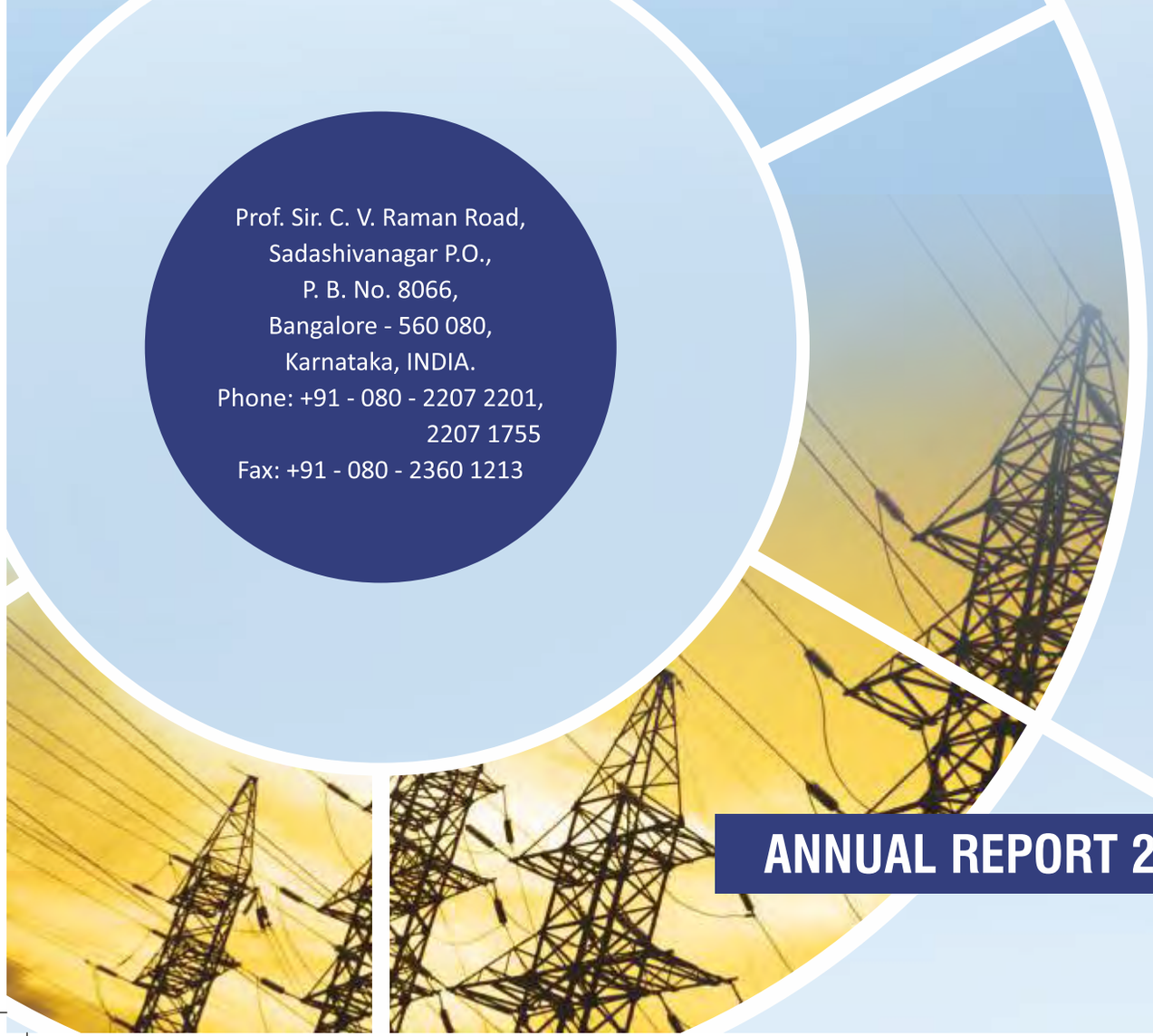

ANNUAL REPORT 2016-17

FOREWORD

The performance of the Institute for the year 2016-17 was noteworthy in terms of achievement against the targets, establishment of a few important facilities, special tests carried out, services offered to Indian and Foreign clients, relations with stakeholders, landmark events etc.

During the year, CPRI organized many National/International Conferences/Workshops. The details of some of them are given below:

1) The Cables & Diagnostic Division, CPRI, Bangalore has successfully organized 9th International Conference on Power Cable Technology "CABLETECH 2017", on 9th & 10th February 2017. Around 175 delegates from various Utilities, Manufacturers & Academic Institutions participated in the International Conference. This includes twenty foreign delegates participation from various Countries like Germany, UK, Singapore, Italy, Japan, Korea, Switzerland, Dubai etc. The Conference was inaugurated by Shri B. P. Pandey, IAS, Special Secretary, Ministry of Power, Govt. of. India. The presidential address was delivered by the Guest of honour Shri Rakesh Amol, Chairman, Cable Division, IEEMA.

2) High Voltage Division, CPRI, Bangalore & UHVRL - CPRI, Hyderabad jointly organized 2nd National Conference on High Voltage Engineering & Technology (NCHVET), at CPRI, Bangalore, on 27th & 28th January 2017. More than 120 delegates attended the Conference where more than fifty technical papers were deliberated.

3) National Conference on "Emerging trends, Challenges in Transformer Design, Testing & Maintenance", organised by Switchgear Testing & Development Station (STDS), CPRI, Bhopal on 3rd & 4th February 2017, at Noor Us Sabah Palace Hotel, Bhopal. There were 250 delegates from all over India for the Conference and 38 technical papers were presented by various organizations like NTPC, Crompton Greaves, Bharat Bijlee, GE, BHEL, Bhopal, Powergrid, Easun MR, Chennai., T&R, Ahmedabad, OPTCL etc. The Chief Guest of the function was Shri A. K. Jha, Director, Technical, NTPC. Shri D. K. Thakur, ED, BHEL was Guest of Honour, Shri Katsutoshi Toda, Chairman, Toshiba gave key note address.

CPRI has been fortunate to get large chunk of 12th Five Year Plan funding to the extent of Rs. 1182.00 crores for the four major projects during 12th Plan. These projects are under implementation and in the coming 2-3 years projects would be completed and will pave way for upgrading CPRI test facilities to the global level and CPRI will be geared up for rendering research and testing services in the next decade. Important facilities proposed under these projects are:

- Additional Generators for HPL, Bangalore (2500 MVA to 7500 MVA) - Rs. 509.00 Cr.
- On-line short circuit test facility at UHVRL - CPRI, Hyderabad - Rs. 120.00 Cr.
- Modern Tower Testing Facility (upto 1200kV rating towers) at UHVRL - CPRI, Hyderabad - Rs. 90.00 Cr.
- Establishment of Regional Testing Laboratory at Nashik - Rs. 115.30 Cr.
- Relocation of TRC - CPRI, Nagpur - Rs. 48.00 Cr.
- Temperature rise test (40 kA) facility at High Power Laboratory - CPRI, Bangalore - Rs. 15.00 Cr.
- Enhancement of oil test facilities & Energy meter test facilities - Rs. 22.10 Cr.
- Smart Grid and Phasor Measurement Unit Laboratory - Rs. 17.70 Cr.

During the current year, CPRI has established the Impulse Current Laboratory at CPRI,

FOREWORD

Bangalore as a Comprehensive facility for testing of Zinc Oxide ZnO arrester elements and pro-rated sections of rated voltage from 3kV to 12 kV as per IEC 60099-4 Edition -3 , 2014, and IS 3070 Part III and IEEE C62.11, 2012 edition. The laboratory was inaugurated on 18th February 2017, by Shri Pradeep Kumar Pujari, IAS, Secretary, Ministry of Power, Government of India, in the presence of Dr. Arun Kumar Verma, IAS, Joint Secretary, Ministry of Power, Government of India, Shri Indu Shekar Jha, Chairman and Managing Director, PGCIL, Shri. N.N.S.S. Rao, Superintending Engineer, CPWD and Shri V. S. Nandakumar, Director General , CPRI.

The performance of the Institute with regard to set parameters are all time high despite prevailing slump in the manufacturing sector. The total receipts for the year was Rs. 183.85 crores compared to the last year's figure of Rs.159.20 crores achieved. The officers of CPRI have published / presented a total of 149 technical papers including 60 papers in the International Conferences & Journals. The events numbering 56 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 6 patents during the year.

Central Power Research Institute, Bangalore was awarded the prestigious Rajbhasha Keerthi Puraskar- Second for the successful efforts in the progressive use and Implementation of Hindi for the Offices in Region 'C' during the year 2015-16. The award was presented by Honourable President of India, Shri Pranab Mukherjee, during Hindi Divas function organized at Rashtrapathi Bhavan, New Delhi, on 14th September 2016 which was received by Shri Sudhakar R. Bhat, Director General of the Institute. The Institute was awarded this for the 7th time consecutively, which is also the 11th award won by CPRI so far.

The Institute while rendering services to the Industries & Utilities in the last several decades has continued to interact with Industry association. Furthering this cause, CPRI had interactive meet with IEEMA in the Sub area of Switchgear Division, meeting with IEEMA International Business Division, and Meeting with Dubai Electricity and Water Authority (DEWA).

CPRI is also in the process of establishing additional centres for establishing Test Centres for Distribution Transformers and Energy Meters in its bid to provide testing services with better access to MSME in various regions.

On the consultancy front, CPRI has been carrying out the largest number of Third Party Protection Audits for BBMB, UPPTCL, PSTCL substations in a big way. The Institute is taking a lead in the Smart Grid area at the National Level through Smart Grid Task Force & National Forum on Smart Grid and also doing a consultancy project for TSSPDCL (Telangana Utility), and Puducherry. In addition, pollution mapping with reference to transmission system in Eastern & Southern regions is in progress.

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

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

(V. S. Nandakumar)
Director General

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MEMBERS OF CPRI GOVERNING COUNCIL AS ON 31ST MARCH 2017

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

Shri Ravindra Kumar Verma
Vice President
Chairperson, Central Electricity Authority
Sewa Bhawan, R. K. Puram, New Delhi - 110 066

Shri B. P. Pandey, IAS
Special Secretary
Ministry of Power, Shram Shakti Bhawan, Rafi Marg
New Delhi - 110 001

Shri K.K. Arya
Member (Power Systems)
Central Electricity Authority, Sewa Bhawan, R. K. Puram
New Delhi - 110 066

Shri Pankaj Batra
Member (Planning), Central Electricity Authority
Sewa Bhawan, R. K. Puram,
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Dr. Pradeep Kumar, IAS
Joint Secretary & FA
Ministry of Power, Shram Shakti Bhawan, Rafi Marg,
New Delhi - 110 001

Shri Raj Pal
Economic Adviser
Ministry of Power, Shram Shakti Bhawan, Rafi Marg
New Delhi - 110 001

Shri Abhay Bakre
Director General, Bureau of Energy Efficiency
4th Floor, Sewa Bhavan, Ramakrishna Puram
New Delhi - 110 066

Shri S.K. Singh (Advisor, MNRE)
Director General, National Institute of Solar Energy
19th Milestone, Institutional Area, Gurgaon-Faridabad, Gwalpahari
Gurugram, Haryana – 122005

Prof. S. C. Srivastava
Deputy Director & Professor
Dept. of Electrical Engg., Indian Institute of Technology
Kanpur - 208 016

MEMBERS OF CPRI GOVERNING COUNCIL AS ON 31ST MARCH 2017

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Central Board of Irrigation & Power,
Malcha Marg, Chanakyapuri, New Delhi - 110 021

Shri Sanjay Sardana
President-IEEMA, Managing Director
Yamuna Power & Infrastructure Ltd, 3/101 Kaushalaya Park
Hauz Khas, New Delhi - 110 016

Shri Atul Sobti
Chairman & Managing Director
Bharat Heavy Electricals Ltd.
BHEL House, Siri Fort, New Delhi - 110 049

Shri Ramesh Abhishek, IAS
Secretary, Ministry of Commerce & Industry
Dept. of Industrial Policy & Promotion
Room No. 341B, Udyog Bhawan, New Delhi - 110 011

Dr. Girish Sahni
Secretary, DSIR
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Shri Gurdeep Singh
Chairman & Managing Director, NTPC Ltd.
NTPC Bhawan, SCOPE Complex,
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Shri I S Jha
Chairman & Managing Director
Power Grid Corporation of India Ltd.
'Saudamini', Plot No. 2, Sector 29, Gurgaon, Haryana - 122 001

Shri V. S. Nandakumar
Member - Secretary
Director General, Central Power Research Institute,
Post Box No. 8066, Bangalore - 560 080

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 1

ORGANIZATIONAL SET-UP

ORGANIZATIONAL SET-UP

CPRI - an overview

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

Objectives of CPRI

Technical

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

Financial

- Accept grants of money and other assistance from the Govt. of India and other sources, Indian or foreign or enter into any agreement with them with a view to promote the objectives of the Society provided that in respect of foreign resources prior approval of the Government of India is obtained.

- Acquire by gift or purchase or exchange or lease or hire or otherwise, howsoever, any lands, buildings situated in India, equipment and any other properties movable and or immovable for the furtherance of the objectives of the Society and construct or alter any building which may be necessary for the Society.
- Sell or lease or transfer or exchange or mortgage or dispose of or otherwise deal with any properties whatever belongings of the Society, provided that prior approval in writing of the Central Government is obtained.
- Draw, make, accept, endorse and discount cheques, notes or other negotiable instruments.
- Invest the funds or money of the Society not immediately required in any securities or in such manner as from time to time to be determined by the Governing Council.

Administrative

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

Management

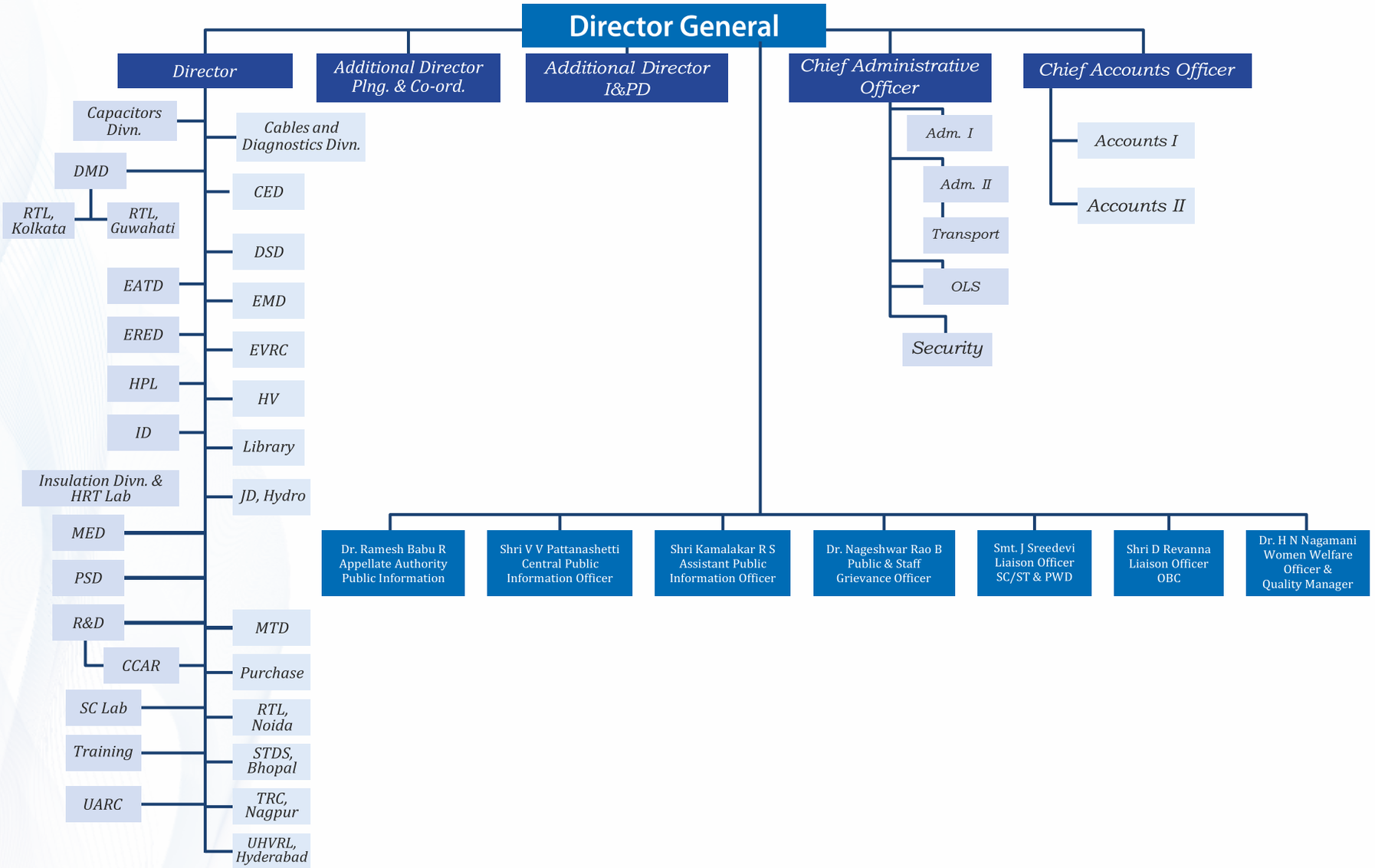
The management of the institute vests in its Governing Council comprising members representing different Utilities, Ministries of the Government of India, Central Electricity Authority, State Electricity Boards, Power Supply Utilities, Indian Electrical & Electronics Manufacturers' Association, and various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

A Standing Committee under the Chairmanship of Special Secretary/Additional Secretary, MoP with Member (Power Systems), Central Electricity Authority, Joint Secretary & Financial Advisor 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 2017)



CENTRAL RESEARCH & TESTING LABORATORY
P. B. No. 8066,
Prof. Sir. C. V. Raman Road,
Bangalore - 560 080

SWITCHGEAR TESTING & DEVELOPMENT STATION
Govindpura, Near BHEL,
Bhopal - 462 023

ULTRA HIGH VOLTAGE RESEARCH LABORATORY
P.B. No. 9, Uppal P.O.
Warangal Highway,
Hyderabad - 500 098

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

THERMAL RESEARCH CENTRE
CPRI Colony,
Vidyut Vihar, Koradi,
Nagpur - 441 111

REGIONAL TESTING LABORATORY
No. 3A, Sector - 62,
Institutional Area,
Noida - 201 309

REGIONAL TESTING LABORATORY
1st Floor, CTD Workshop,
WBSEDCL,
Abhikshan Building,
BN Block, Sector - V,
Salt Lake City,
Kolkata - 700 091

Central Research & Testing Laboratory (CRTL), Bangalore

Centre for Collaborative & Advanced Research (CCAR)

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

The main objectives of the centre are to:

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

Cables & Diagnostics Division

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

Activities:

- Testing
- Consultancy
- Research & Development

Laboratories:

- Power Cables Laboratory
- Diagnostics Laboratory

Power Cables Laboratory

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

Consultancy:

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

Research & Development Capabilities:

- Development of HV DC Cables
- Any specific problem on Power Cables & accessories.
- Characterization of the unwanted fire by determining the various parameters like

Rate of heat release, Rate of heat release per unit area, Mass loss rates

Time-to ignition, Effective heat of combustion, Rates of release of toxic gas, Critical ignition flux

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

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

The diagnostic field tests include the following :

Product / Apparatus & Tests :

HYDRO / TURBO GENERATORS

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

R & D Capabilities :

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

- Paper – oil insulation system
- Power Cable insulation system
- Rotating Machine insulation system
- Study on Static Electrification in large Power Transformers

Partial Discharge test on 110 MW Turbo Generator

ELCID Test on Hydro Generator

- 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)

Power Capacitors Laboratory

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

Testing of LV APFC Panels

Tests on LV APFC panels are carried out as per IEC 61921 and IEC 6143. The temperature rise tests 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 at elevated ambient temperature of 55 ° C. The general ratings covered for testing are 3-phase 440 V APFC panels of output ratings 25 kvar, 75 kvar, 150 kvar, 200 kvar, 350 kvar, 375 kvar, 400 kvar, 450 kvar, 500 kvar, 800 kvar. Any other in-between ratings can also be tested.

Environmental tests

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

Research and Consultancy

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

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

Dielectric Materials Division (DMD)

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

This division has the following laboratories :

- Liquid Dielectrics Laboratory
- Polymer Laboratory
- Lubricating Oil Laboratory

The Division has developed several polymeric materials, namely epoxy novolok resin for insulators & electrical grade laminates and FRLS cables for critical safety applications. The Liquid Dielectric Laboratory has developed new techniques for dissolved gas analysis. Expertise in Furan analysis interpret 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. 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. The activities of the RGGVVY as TPIA consultant and R-APDRP as TPIEA consultant related works at CPRI are being coordinated by the Distribution System Division. Research Consultancy assignments as well as the SCADA and distribution reforms related works are taken up by this Division.

Electrical Appliances Technology Division (EATD)

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

The Laboratories operating under this Division are :

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

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

Earthquake Engineering & Vibration Research Centre (EVRC)

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

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

Energy Efficiency & Renewable Energy Division (ERED)

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

The laboratory has facilities for evaluating and certifying:

- Solar Photovoltaic Lanterns & Pumps
- Compact Fluorescent Lamps and LEDs
- Solar Home Lighting and Street Controllers
- LED Lighting System
- Solar Photovoltaic Panel Testing

- Grid Tied Inverter Testing
- Motor Testing

High Voltage Division (HVD)

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

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

The following Laboratories operate under this Division :

- High Voltage Laboratory
- Pollution Laboratory
- Impulse Current Laboratory

High Power Laboratory (HPL)

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

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

The facilities available in this Laboratory are as follows:

- Direct testing facility 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

Instrumentation Division (ID)

This Division has facilities for Research and Development of Electronic Instrumentation for Power Systems.

The following Laboratories operate under this Division:

- Calibration Laboratory
- Energy Meter Testing Laboratory

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

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

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

Insulation & Heat Run Test Laboratory (INS & HRT)

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. This division also provides services for carrying out temperature rise test on various electrical apparatus as per National and International Standards.

Laboratories available are:

- Solid Dielectrics Laboratory
- Heat Run Test Laboratory

Solid Dielectrics Laboratory

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

Weathering using Xenon Arc Lamp

Cyclic Corrosion Test Equipment

Heat Run Test Laboratory

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

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

1. LT Panel

2. Isolated Phase Bus Duct

3. Isolator

Materials Technology Division (MTD)

This Division has different Laboratories for evaluating and development of organic and inorganic materials and evaluation of coal, water etc.

The Laboratories operating under this Division are:

- Materials Characterization & Engineering Laboratory
- Corrosion Laboratory
- Analytical Laboratory
- Power Station Technology and Field Engineering

Application Laboratory:

- Wear & Erosion and Mechanical Evaluation Facilities
- Fuel Analysis and Combustion Research Laboratory
- Remaining Life Assessment and Renovation & Modernization
- Industrial Solid Waste Utilization Centre

Mechanical Engineering Division (MED)

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

The Laboratories operating under this Division are:

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

Power Systems Division (PSD)

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

The Division has the following facilities:

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

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

Short Circuit Laboratory (SCL)

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

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

Training Division

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

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

Utility Automation Research Centre (UARC)

This Division is the backbone of all information Technology activities at CPRI, which caters to both software and hardware needs of the organization. The Division 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.

UNITS OF CPRI

Switchgear Testing & Development Station (STDS), Bhopal

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

STATION I : Direct Short Circuit Test Station of 1250 MVA capacity at 12 kV capacity utilizing two specially designed 1500 MVA short circuit alternators, G 1 of M/s Orlinkon make and G2 of M/s Alstom make. This station mainly caters to short circuit tests on high and Medium Voltage Switchgears, Transformers and other allied equipment.

STATION II : The On-line Testing Station is drawing power up to 100 MVA from the MPSEB Grid from the Chambal Substation through 132 kV three single phase circuit. 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. The unit also hosts a Transformer Oil Evaluation Laboratory to conduct in-service oil evaluation.

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

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

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

Other Facilities:

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

Regional Testing Laboratory (RTL), NOIDA

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

The Laboratory was 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 Bangalore and other units. Various Laboratories housed under this units 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, routine testing on Distribution Transformers and a Transformer Oil Evaluation Laboratory. The Unit also hosts facilities for evaluation of energy meters and diagnostic evaluation of power equipment.

Thermal Research Centre (TRC), Nagpur

This Centre situated near Koradi Thermal Power Station, Koradi, is mainly intended for taking up consultancy and R&D work pertaining to Thermal Power Stations. The Centre is also equipped to take up consultancy work in the area of environmental impact assessment and investigations on fuel treatment, ignition studies, coal characteristics, pilot scale studies for coal gasification, slurry fuels, life estimation of Thermal Power Plant components, renovation & modernization of thermal power plants etc. This Centre undertakes remaining life assessment and renovation & modernization of Thermal Power Stations and has provided consultancy services to more than fifty Thermal Power Stations.

Ultra High Voltage Research Laboratory (UHVRL), Hyderabad

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

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

The above mentioned objectives are realized by the following facilities:

Experimental Line

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

Mock-Up Tower

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

Pollution Test Chamber

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

Cascade Transformer

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

Impulse Generator

The Impulse Generator 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 at CPRI, Hyderabad

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

A View of ± 1200 kV DC Test System

Regional Testing Laboratory (RTL), Kolkata

This was 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 also co-ordinates activities of oil laboratory located at Guwahati, providing services to the North Eastern parts of India.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 2

RESEARCH & DEVELOPMENT

RESEARCH & DEVELOPMENT

- In-house Research & Development Projects (IHRD)
- Research Scheme on Power (RSoP) Projects
- Research Projects on National Prospective Plan
- Impacting Research Innovation and Technology (IMPRINT)
- Uchhatar Avishkar Yojana (UAY)
- Sponsored Projects

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.**

Separate 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.**

In-House Research & Development Projects

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).

During the year 2016-17, thirty two (32) projects were under progress and seven (7) projects were completed. The following is the summary of the on going in-house research projects at CPRI:

Ongoing In-House Research & Development Projects

Sl.No.	Title	Objective	Progress
1.	**Assessment of low cycle thermal fatigue damage in steam turbine during transient** Outlay: Rs.50 Lakhs Start Date: November 2014 Scheduled End Date: October 2016 Extension has been sought till October 2017	• Damage assessment of turbine components based on low cycle thermal fatigue	• Literature review is completed • Computer Aided Design (CAD) software is procured and installed. • A high capacity computer (work station) is procured, installed and commissioned. • Finite Element Analysis (FEA) software will be installed shortly. • Recruitment of one Senior Research Fellow (SRF) is under progress. • Analytical solutions to fatigue damage was completed. Further work in this direction is under progress • Drawings of design and details of capacity of the turbines were received and analysed.
2.	**Smart Inverter with E meter and IOT** Outlay: Rs. 46.80 Lakhs Start Date: November 2014 Scheduled End Date: October 2016 Extension has been sought till December 2017	• To develop a novel multilevel inverter with reduced power switches and to study the performance of inverter for a micro grid • Study and review of the existing and ongoing Internet of Things (IoT) technologies relevant to inverter and E meter to	• Simulation of seven level, nine level multilevel and eleven level inverters using MATLAB were completed. • Different PWM techniques like Phase Opposite Displacement (POD), Alternative Phase Opposite Displacement (APOD), In Phase Displacement (IPD) and Level shift

Sl. No.	Title	Objective	Progress
		analyze the implementation aspects and IoT based network communication requirements • Design, develop and simulate various architectures and prototype of Internet of Things based solutions	techniques were applied to reduce Total Harmonic Distortion (THD). • Simulated annealing techniques were used to reduce THD for seven and eleven level inverters. • Development of multilevel inverter hardware is in progress. • IoT devices, analysis of the implementation aspects and IoT based network communication requirements is in progress.
3.	**A Reliable Optimal Smart Metering Infrastructure for Smart Grid** Outlay: Rs.70 Lakhs Start Date: November 2014 Scheduled End Date: October 2016 Extension has been sought till December 2017	• To Study and review of existing and ongoing Smart Metering Infrastructure (SMI). • To analyze the requirements of implementation network communication. • Design, Develop and simulate various architecture for smart metering solutions. • To develop an integrated SMI infrastructure for an end to end user access. • To Study the Time of Day (TOD) and Time of Use (TOU) tariff for Advanced Metering Infrastructure (AMI). • To explore the possibilities like prepaid metering using Internet of Things. • To develop techno commercial business case for a reliable optimal smart metering infrastructure for smart grid.	• Literature survey on smart metering has been completed. • Smart metering methodology. ➢ The Smart metering infrastructure options with the existing infrastructure were compared. ➢ The open standard stacks formation for smart metering was studied. ➢ New emerging technologies and their impact on implementation for smart metering like 6TiSCH was explored. • Demonstration of efficiency of Channel hoping technology over the single channel communication with experiments were considered. • Evaluation of the performance of 6TiSCH technology was completed
4.	**A Novel Optoelectronic Technique for Online Partial Discharge Monitoring of Transformers** Outlay: Rs.36 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Study the different possible Partial Discharge (PD) behavior in transformer (considering the effect of transformer oil on the propagation of the PD signal) with optoelectronic sensor and collection of the data bank. • Detection of different kinds of PD occurrences using new method of optoelectronic	• Preliminary studies on breakdown strength of paper mineral oil insulation under different electric field conditions have been completed. • PD measurements by conventional methods under different electric field condition and mineral oil contamination is under progress.

Sl. No.	Title	Objective	Progress
		sensor in the replicated transformer model. • Using pattern recognition technique to present and interpret the different kinds of PD measured results from replicated transformer model. • To recognize the location of PD occurrence in replicated transformer model. • To recognize multiple PD sources in replicated transformer model by their patterns. • Quantification of optically detected PD signals in correlation with apparent charge method in a replicated transformer model.	
5.	**Studies to Establish Critical Resistive Leakage Current of Gapless ZnO Polymeric Surge Arresters for In-service Failure Prediction** Outlay: Rs.21.50 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To determine the critical resistive leakage current beyond which the arrester shall be removed from the service to avoid a sudden explosion of the arrester components in the event of its sudden failure due to internal short circuit damaging nearby substation equipment / personnel. • To determine the life time of the arrester at few current levels close to the critical current • Determine the threshold resistive leakage current level and estimate the life time of the arrester at this current which is used to predict the possible arrester's failure and take the necessary corrective actions like taking a decision depending on the value and trend in rise of resistive leakage current either for close monitoring or for replacement of a surge arrester in service with new one. • To develop electro-thermal model of a ZnO surge arrester to facilitate arriving at the critical resistive current as per above objectives for different makes of ZnO arresters used in the country.	• V-I characteristics for different classes of ZnO blocks have been completed. • Experimental set up for the ageing studies has been designed and evaluated.

Sl. No.	Title	Objective	Progress
6.	**A Laboratory Investigation for Standardization of Testing Method for Pollution Performance of Polymer Insulators** Outlay: Rs. 20.90 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Repeat & compare the presently followed test methods-Round Robin Test procedure & results by CIGRE working group C4.303 for their applicability and reproducibility. • To study the behavior of polymeric material in pollution condition under Tracking & Erosion Test with different coating material and coating thickness to arrive at best possible coating techniques. • Formulate technique to adopt the optimized coating method on to a complete insulator. • Carrying out Maximum withstand pollution severity test on about 10 insulators & check for repeatability of test results. • Formulation of standards for pollution testing of polymeric insulators.	• Review of Literature and procurement of necessary equipments are completed. • Different methods of standardization of pollution performance of insulators is in progress.
7.	**Assessment of Pollution level and Design of External Insulation for High Voltage Transmission System** Outlay: Rs.11.50 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• The objective of the project is to establish a correlation between the pollution severity and the withstand voltage characteristics of insulator strings. • The impact of profiles of insulators on pollution withstand voltage has to be identified and analysed, so that such necessary correction has to be incorporated in the designing of insulators in future. • To avoid pollution flashover of insulators in high voltage and extra high voltage environment, statistical evaluations of pollution withstand characteristics of insulators with different level of severity against various profiles will be investigated. • Selection of insulator in HV lines has to be made on such statistical evaluation for the optimised operation of the transmission system.	• Review of Literature and procurement of necessary equipments are completed. • The assessment of pollution levels and its influence on design of External Insulation for High Voltage Transmission is under progress.

Sl. No.	Title	Objective	Progress
		Inference has to be made on the testing severity in laboratory by conducting studies on the pollution mapping of northern region of India.	
8.	**Wide Area Measurement System (WAMS) based Fault Signature Analysis for fault detection and location assessment using measurements from Phasor Measurement Units (PMUs)** Outlay: Rs. 49.35 Lakhs Start Date: April 2016 Scheduled End Date: March 2019	• To study and review the available Fault Detection techniques from Literature • To develop a fault detection and location algorithm • To use PMU data along with other data for fault detection and location • To explore the possibilities like fast fault identification using Wide Area Measurement System	• Literature review has been completed. • The process of implementation of the power system simulation tool for monitoring was initiated and will be used for fault simulation.
9.	**Effect of harmonic due to large scale penetration of Rooftop SPV Power Plant** Outlay: Rs.20 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Study of causes and effects of Harmonics created by grid connected PV systems in a cluster of installations. • Design and Simulation of large scale Grid connected PV system using computer software and the effect of harmonics there off. • Suggest optimum filter for clusters of roof top solar plants	• Review of Literature and procurement of necessary solar PV panel were completed. • Preliminary lab. studies have been carried out.
10.	**Design and Development of 10 kA 1000 V Synchronized Static switch for Evaluation of Breaking Performance of Miniature Circuit Breaker (MCB)** Outlay: Rs. 20 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Design and Development of 10 kA 1000 V Synchronized Static switch for evaluation of breaking performance of Miniature Circuit Breaker (MCB)	• Review of Literature and procurement of necessary equipment were completed. • Design and development of 10 kA 1000 V Synchronized Static Switch is in progress.
11.	**Evaluation of the co-firing characteristics of Alternative Fuels mixed with high ash Indian coals for power generation applications**	• Evaluation of the combustion characteristics (combustion reactivity, slag formation, etc.) of the alternative fuels [biomass & RDF (Refuse Derived Fuel) from municipal solid waste etc.] mixed with high ash coals through	• Some samples of biomass fuels and high ash content coals (different ranks) were collected and experiments were undertaken.

Sl. No.	Title	Objective	Progress
		advanced combustion experiments like TGA, Drop Tube Reactor, were undertaken. • To develop constants and empirical relations for the co-firing of various biomasses and RDF (Refuse Derived Fuel from municipal solid waste) with high ash coals in respect of the combustion, slagging and fouling characteristics using the CFD modeling of retrofitted large scale Indian PC boilers. This will help in assessment of heat transfer and particle dynamics profiles during co-firing. • To develop comprehensive technical database for co-firing high ash Indian Coals with biomass and RDF (Refuse Derived Fuel from municipal solid waste).	
12.	**A study on the effect of nanoparticles on the critical parameters of insulating fluids** Outlay: Rs. 20 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• The aim of this research work is to investigate the effect of nanoparticles (high permittivity and semi-conducting) on the critical parameters of insulating oils and study the mechanism involved in improvement of the Nano Fluids (NF) permittivity and conductivity.	• Review of Literature and procurement of necessary equipment were undertaken. • Different nano fillers have been identified and their stability with different insulating fluid were studied.
13.	**Development of flame retardant polymer composites for insulating applications** Outlay: Rs. 17 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To achieve superior flame retardant properties using Eggshell nanoparticles in developing polymer insulating materials for cable applications. • To evaluate the effectiveness of Eggshell nanofillers as a flame retardant materials • To improve the ability of barrier to prevent flame spread in insulating cables • To extend the practical application of the Polymer nanocomposites in power sector	• Review of Literature and procurement of necessary equipment was completed. • Identification of nano fillers and matrix have been completed. • Different techniques for fabrication of nano composites have been studied for optimizing the nano composite for improved EMI shielding effects

Sl. No.	Title	Objective	Progress
14.	**Dielectric nano-composites for capacitors applications** Outlay: Rs. 44.50 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Fabrication and characterization of dielectric nano-composite by employing nano-ceramics such as doped-CaCu3Ti4O12 and Sr2TiMnO6 ceramics in variety of polymer matrix by melt mixing / hot pressing as well as by solution cast technique.	• The CCTO nanoceramics (undoped) were prepared by soft chemistry route and were used for making composites with Polypyrrole. • Action is initiated for recruitment of Project Associate.
15.	**Development of LDPE, MDPE and HDPE Nano-composite for DC Cable Application** Outlay: Rs. 105 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To identify the best suitable filler materials • Preparation of nano filler based LDPE, MDPE & HDPE insulation • To find the characteristics of the nano filler added polymer material its electrical, thermal and mechanical properties • Creation of the database related to ageing of cable insulating material, its performance after ageing • Manufacturing of cable sample with the new insulation	• Review of Literature and procurement of necessary equipment were completed. • Development and characterization of nano composites for DC applications is under progress.
16.	**Development and Demonstration of an Adaptive Protection Scheme for Distribution Systems under High Penetration of Distributed Energy Resources (DER)** Outlay: Rs. 72.38 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To develop a protection algorithm and its fabrication in hardware prototype relay model. • The proposed protection scheme will help to serve as a demonstration research project in CPRI for further research in the area of protection of distribution system with DERs.	• Work on development of protection algorithm is under progress. • Collaboration with Industry was explored. • Technical paper was presented at NPSC -2016 Conference.
17.	**Study of AC Corona Phenomena and power loss for 1200 kV conductors and characterization of corona discharges from line / substation components** Outlay: Rs. 132 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To experimentally evaluate the AC corona power loss for different configuration bundled conductors under fair and foul weather conditions for 1200 kV transmission lines. • Optimization of bundled conductor configuration based on the corona performance. • To measure RI levels for 1200 kV system lines.	• Review of Literature and procurement of high valued equipments were completed.

Sl. No.	Title	Objective	Progress
18.	**Study of Electric Field Environment of HVDC Transmission Lines** Outlay: Rs. 114 Lakhs Start Date: April 2016 Scheduled End Date: March 2019	• Computation of Ionic Current density, Space Charge density and Electric Field of ± 800 kV transmission line at ground level by using analytical methods. • Laboratory measurement of Ionic Current density, Space Charge density and Electric Field of ± 800 kV HVDC transmission line at ground level. • Comparison of the results of the measurements and computed values with the results obtained by using the existing empirical formulas developed by various researchers elsewhere in the world. • Development of empirical and analytical formula for computation of Ionic current, Space Charge density and Electric field. • To arrive at a final computational method that can be used to derive the limit values of Ionic Current density and Electric Field for the future upcoming HVDC lines in the country.	• Review of Literature and procurement of necessary equipments were undertaken.
19.	**A study on online partial discharge measurement of power cables using inductive couplers and noise elimination by wavelet technique** Outlay: Rs. 92 Lakhs Start Date: April 2016 Scheduled End Date: March 2019	• To develop a proper noise elimination PD Measurement Technique for power cables at site	• Review of Literature and procurement of necessary equipments were undertaken. • Different methods of efficacy of online PD measurement on power cables is being studied.
20.	**Evaluation of re-ignition circuit by replacing the air gap with vacuum interrupter bottles** Outlay: Rs. 92 Lakhs Start Date: April 2016 Scheduled End Date: March 2019	• The presently used air gap have the disadvantage of high delay time and jitter time. The objective of this project is to check the consistency of the triggering with vacuum bottles and get least possible delay and jitter times. The effect of electromagnetic influence will be verified by	• One review paper on the subject matter is under preparation and procurement of equipments is under progress.

Sl. No.	Title	Objective	Progress
		keeping the circuit in open condition and enclosed condition. • This project will pave way for mitigation of the present problems in re-ignition circuits and enable smooth conduction of synthetic tests. Further, as there is large demand for testing of HV circuit breakers and GIS switchgear in our country and abroad, it will lead to good revenue by testing.	
21.	**Development and demonstration of ultra-capacitors and lead-acid batteries based hybrid storage for a 5kW solar-powered micro-grid** Outlay: Rs. 49.50 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To develop a 5kW standalone system for solar based micro-grid. • Design and develop a hybrid power pack for 5kW standalone system using lead-carbon-based hybrid ultracapacitor and lead-acid battery system. • Integration of hybrid power pack to panel and load. • Validation of test parameters of energy storage like terminal voltage, current and energy discharge based on load. • Optimization of lead-carbon and lead-acid based hybrid power pack energy management system. • Characterization and modeling of hybrid power pack of 5kW storage system. • Demonstration of the 5kW micro-grid.	• Review of Literature and procurement of necessary equipment are under progress. • Development of super capacitor and its evaluation is under progress.
22.	**Development of gasification reactor system for conversion of multi fuel to syngas** Outlay: Rs. 91 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Design and development of a lab scale microwave based plasma gasification reactor through expert institutes like Institute of Plasma Research, Gandhinagar (Department of Atomic Energy), etc. • Studies on the mechanism behind the conversion of Multi-Fuel to syngas using the gasification reactor. • Studies on the properties of syngas as a fuel. • Modeling studies for verification and validation of reactor design and gasification process. • Demonstration of energy recovery / utilization.	• Technical Discussions were held with M/s. Well Tech Engineers, Hyderabad on the design of water cooled plasma reactor and slag removal system • Technical discussions were held with M/s Brabender Technologies, Kolkata on multifuel powder feeding system (twin screw method) for 2 kg/hr. • Technical discussions were held with Institute of Plasma Research (IPR), Gandhinagar on the Microwave torch for 25KW system.

Sl. No.	Title	Objective	Progress
23.	**Development and demonstration of 1 k W soluble lead redox flow battery system for solar energy and retrieval** Outlay: Rs. 77 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Research and Development on carbon based electrode materials and suitable electrolyte (synthesis, characterization and fabrications). • Basic studies such as electrolyte concentration, flow rate, temperature effects on performance of battery and effects of charging current density on cell, will be studied on single cell. • Single cell, battery and module design, and their electrochemical performance individually. · Specific power and energy, energy efficiency, cycle lifetime, cost of power conversion and safety issues shall be studied. • Development of 1 kW SLRFB, and integration with PV based energy source.	• Design of Chemical Vapour Deposition set up is completed. • A single cell assembly is designed and fabricated. • Charge / Discharge profile, cycle and efficiency of the cell is investigated
24.	**Run-of-the-River low head micro hydroelectric system for off-grid microgrid operation** Outlay: Rs. 93.50 Lakhs Start Date: April 2016 Scheduled End Date: March 2018	• Setting up a test facility for simulation study of micro hydroelectric schemes • Modelling and optimization of various technologies like screw turbine, artificial vortex scheme. • Comparative study on different generator technologies for micro/mini hydroelectric generation • Operation and control issues in off-grid	• Review of Literature and procurement of necessary equipment are under progress. • Consultants are identified and line drawing of the expected set up incorporating various components is prepared
25.	**Smart grid, Smart transmission Systems, Phasor measurement units, Wide area measurement systems** Outlay: Rs. 110 Lakhs Start Date: April 2017 Scheduled End Date: March 2019	• To design and develop supplementary controls for High Voltage Direct Current (HVDC) & Flexible AC Transmission System (FACTS systems) with Phasor measurement units • To synchronise utilization of HVDC links and FACTS devices with supplementary controls to improve the dynamic performance and security of the power system.	• Literature survey was completed • Preliminary studies were undertaken

Completed In-House Research & Development Projects

Sl. No.	Title	Objective	Progress
01.	**Studies on stability of various Insulating Liquids under electrical discharge** Outlay: Rs.30 Lakhs Start Date: October 2014 End Date: March 2017	• Compare the stability of insulating oils under electrical discharge with conventional test methods.	• Project has been completed and technical report was submitted to CPRI.
02.	**Effect of Additives on Gassing Tendency and other Electro Chemical Properties of Transformer Oil as well as Copper Corrosion of paper oil Insulation System** Outlay: Rs.40 Lakhs Start Date: October 2014 End Date: March 2017	• To assess the effect of additives such as Diteriary-Butyl-Para-Cresole (DBPC), DiBenzilDiSulfide (DBDS), Irgamet 39 and an amine type antioxidants on gassing tendency of transformer oil • To monitor the residual concentration of these additives in transformer oil when subjected to accelerated thermal ageing in presence of oxygen and nitrogen • Effect of residual additives on electrochemical properties of transformer oil • Monitoring the copper ion concentration in transformer oil	• Project has been completed and technical report was submitted to CPRI.
03.	**Development of on line Dissolved Gas Analysis system for power transformers** Outlay: Rs.35 Lakhs Start Date: October 2014 End Date: March 2017	• Development of online gas analyzing system for power transformers	• Project has been completed and technical report was submitted to CPRI.
04.	**Development of Technology of Reconditioning and Reclamation of Turbine Lubricants – Phosphate Esters** Outlay: Rs.39 Lakhs Start Date: October 2014 End Date: March 2017	• Development of technology for removal of free acids • Development of dehydrating technique for phosphate esters. • Removal of suspended particles • Evaluation of lubricant for its characteristics	• Project has been completed and technical report was submitted to CPRI.
05.	**Laboratory studies on the performance of natural esters as replacement to mineral insulating fluids**	• To take up exploratory studies on oils obtained from natural esters and their suitability to be used as liquid insulating materials. Experiments are also carried out to modify the parameters which are beyond the acceptable	• Project has been completed and technical report was submitted to CPRI.

Sl. No.	Title	Objective	Progress
	Outlay: Rs.5 Lakhs Start Date: November 2014 End Date: October 2016	criteria as per the International Standards IEC -62770. • Establish test facility for biodegradability tests on natural esters according the OECD 301B, as required by IEC 62770	
06.	**Development of Nano-Ash Polymer Composites for Electromagnetic Shielding Application** Outlay: Rs.10 Lakhs Start Date: October 2014 End Date: March 2017	• To identify advanced filler materials for EMI shielding applications. • Characterization and evaluation of filler materials selected. • Preparation/processing of polymer/conductive fillers for EMI shielding applications. • Identification and establishment of techniques to optimize the properties of the composites. • Identification and establishment techniques to prepare and incorporate the nano fillers into polymer matrix • Development of process methods to obtain composites with high EMI shielding effectiveness	• Project has been completed and technical report was submitted to CPRI.
07.	**A Study to evolve a Comprehensive Test to distinguish between the Qualities of Primary and Secondary Grade Electrical (CRGO) Steels** Outlay: Rs.15 Lakhs Start Date: October 2014 End Date: March 2017	• Procure / obtain primary and secondary steels from well-known and reputed sources as well as unknown sources and also obtain secondary grade steel materials from used electrical equipments. • Perform detailed magnetic and metallurgical tests on the various types of steels. • Perform detailed mechanical and metallurgical tests such as tensile strength, hardness, microstructure and grain orientation, residual stress, structural phases, oxidation and aging characteristics etc. • Compile and correlate the various parameters / characteristics. • Identification and assertion of any unique and specific characteristics that may be helpful to distinguish between the quality of primary and secondary grade CRGO steels.	• Project has been completed and technical report was submitted to CPRI.

Research Scheme on Power (RSoP) Projects

The project proposals are invited from academia, power utilities, electrical equipment manufacturing companies 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.

During the year 2016-2017, thirty (30) projects were under progress and five (05) projects were completed. The following is the summary of the ongoing RSoP projects:

Ongoing RSoP Projects

Sl. No.	Title	Objective	Progress
01.	**Hydrogen Fuel Generation by Splitting of Water using Nanosized Metal Doped Layered Titanates for Fuel Cell Applications** **Implementing Organization:** Anna University and UoM, Chennai Outlay: Rs.29.87 Lakhs Start Date: January 2015 Scheduled End Date: March 2017 End date by Extension: July 2017	• To develop a robust, visible active and band gap engineered nano photo catalysts to split water into hydrogen fuel and oxygen. • To fabricate a photo catalytic splitting device to evaluate the catalytic activity of the photo catalyst towards hydrogen generation. • To hook up the device with commercially available fuel cell to check the conversion of hydrogen gas into electricity.	• Lanthanum Titanates were synthesized by polymeric complex method. • The synthesized Lanthanum titanates were characterized by using UV-Visible DRS and XRD techniques.
02.	**Design and Optimization of Feedback Controller for Boost type dc-dc Converters using Artificial Immune System** **Implementing Organization:** National Institute of Technology, Tiruchirapalli Outlay: Rs. 8.64 Lakhs Start Date: January 2015 Scheduled End Date: March 2017 End date by Extension: June 2017	• To design a robust feedback controller for a boost type dc-dc converter • The control parameters of the feedback controller design for boost converter should be formulated as an optimization problem and the solution has to be sought through steps of Artificial Immune System (AIS) • The proposed controller has to be validated by comparing it with the conventional controller and genetic algorithm approach • The design should reject internal and external disturbances over a wide range of operating points to make the controller more suitable for various power electronics applications	• Simulation studies for existing technology were carried out. • Design and simulation of boost type dc-dc converters with feedback system using Matlab was completed. • Optimization of control parameters using Artificial Immune System was undertaken

Sl. No.	Title	Objective	Progress
03.	**Use of Synchorphasors in Power System Load Modelling and State Estimation** **Implementing Organization:** Indian Institute of Technology, Kanpur Outlay: Rs.43.20 Lakhs Start Date: January 2015 Scheduled End Date: January 2017 End date by Extension: July 2017	• To develop and validate synchrophasor-based algorithms and techniques for real-time estimation and validation of the models of aggregate loads in an electric power system. • To develop the 'next generation' hybrid state estimator that will incorporate the synchronized as well as the conventional measurements to obtain the best possible states of the power system. • To develop methodologies for multi-area state estimation. The Common Information Model (CIM) of power system data will be explored from the perspective of multi-area state estimator. • To design methodology for conversion of vendor specific state estimation data exchange process to vendor-independent data exchange process and to define a mechanism of a CIM compliant process for data exchange between the state estimator and other Energy Management System (EMS) applications. • To build on the research on Smart Grid control and operation already completed by the team of investigators from the host academic institute.	• Compilation of literature survey on the existing work load modelling, hybrid state estimation and multi-area state estimation were undertaken. • Procurement of the equipment needed for the project were completed. • Hiring of the required manpower for the project was undertaken.
04.	**Wide - Area Damping Controller Design for Power Systems** **Implementing Organization:** National Institute of Technology, Rourkela Outlay: Rs. 29.83 Lakhs Start Date: January 2015 Scheduled End Date: March 2017 End date by Extension: June 2017	• To investigate effectiveness of the available Power System Stabilizer (PSS) based wide-area control in power systems. • To investigate the effect of communication delay arising in such closed-loop control of power system oscillations using real-time measurements. • To study control design methods for systems with time-delays applied to power systems. • To study and develop dynamic modeling of oscillatory modes from real-time measurement data. • To study and develop dynamic compensation algorithms for damping of such oscillatory modes online.	• Damping controller design with known models of power systems was taken up. • Identification of inter-area oscillation modes of power system was completed. • Literature survey was completed.

Sl. No.	Title	Objective	Progress
05.	**Development of High temperature Low Sag Nanocomposite Core** **Implementing Organization:** Siddaganga Institute of Technology, Tumkur Outlay:Rs.28 Lakhs Start Date: June 2016 Scheduled End Date: May 2018	To achieve the following parameters for nano composites: • High strength • Low Coefficient of Thermal Expansion (CTE) • Low creep • Low corrosion rate • Increased ampacity • Efficiency, capacity and reliability of the electrical transmission and distribution power grid • Durability in existing right-of-ways.	• Exhaustive literature survey has been carried out. • Based on the knowledge obtained from the literature review, a technical review paper has been submitted and presented in International Conference on Advanced Materials, Manufacturing, Management and Thermal Sciences [AMMMT – 2016], Mechanical Engineering Department at SIT, Tumkur • Glass reinforced epoxy matrix composite for the development was identified and procured. • Basic tests such as tensile, hardness were carried out. • Temperature controlled oven was procured.
06.	**Development and AC Characterization of 2nd Generation High Temperature Superconductor (HTS) based Modular SFCL System** **Implementing Organization:** Inter-University Accelerator Centre, New Delhi Outlay: Rs.49.60 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Defining a single unit module of SFCL. The single modular unit can be a building block for any large-scale modular SFCL structure. • AC Characterization of HTS-based single modular unit at 77K in Ln2. • Standardization of voltage and current rating of single unit of SFCL made of 2G HTS tape for large scale commercial modular SFCL design. • Development of different prototype modular configurations. Comparison of electrical (AC) and dynamic thermal characteristics between different configurations. • Comparison of fault current limiting performance between different modular configurations. • Scale-Up methodology using the modular unit	• An advanced fault current generator with AC voltage 20, 40, 60 is designed and developed. The same has been tested with dummy load. • This system can generate fault with variable faults with 1 cycle to 12 cycles and also fault can be triggered at any angle. • One basic module of SFCL by using AMSC 2G HTS wire (4 mm wide) is developed and preliminary I - V characteristics were established.
07.	**Hybrid HVDC Systems for Multi Infeed Applications** **Implementing Organization:** M.S. Ramaiah Institute of Technology, Bangalore	• To find possible solutions for better stability using a VSC-HVDC as one of the infeed for the multi-infeed system.	• A detailed literature survey was carried out to understand the problems associated with multi infeed HVDC systems inverting into weak AC system is being carried out. The focus is on

Sl. No.	Title	Objective	Progress
	Outlay: Rs.17.00 Lakhs Start Date: August 2016 Scheduled End Date: July 2018		multi-infeed HVDC system combining a conventional LCC-HVDC system and a Hybrid HVDC system with LCC as the rectifier and VSC as the inverter, for supplying a very weak AC network. • A clear understanding of the controllers for VSC – HVDC system and controllers that are being used for multi infeed systems worldwide are being looked into. • A detailed simulation study of VSC – HVDC system in the PSCAD environment, is completed to gain familiarity with the existing controllers. • A 1000 MW-LCC system is simulated and studied thoroughly to understand all the system components and the controllers. • Another 300 MW - LCC system is setup and is studied in details for steady state and transient conditions. The component data and controllers are adjusted to obtain a satisfactory steady state and transient performance. • The above two systems are connected to form a multi infeed HVDC (MIDC) system. Steady state and a few transient studies are carried out. With strong AC system at the inverter, the system is running stably. With weak system, any transient condition results in commutation failure and the system recovery is very difficult. To overcome this problem, the hybrid system is proposed.

Sl. No.	Title	Objective	Progress
08.	**Inferring the dielectric and partial discharge characteristics of nano fluids for power transformer applications** **Implementing Organization:** Sona College of Technology, Salem Outlay:Rs.17 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To prepare nanofluids in the laboratory using base mineral oil and vegetable oils mixed with different nanofillers such as SiO2, TiO2 and Fe3O4 at different nanofiller concentrations. • To investigate the partial discharge characteristics of nano filler added vegetable oils such as sunflower oil, corn oil and palm oil under both virgin and accelerated aged conditions. • To compare the partial discharge characteristics of nano-vegetable oils and nano-mineral oils at both virgin and accelerated aged conditions. • To determine the dielectric properties such as breakdown strength, dissipation factor, relative permittivity and resistivity of the nanofluids. • To apply signal processing techniques to extract important features from the measured PD data of nanofluids. • To perform statistical analysis of breakdown strength of nanofluids using Weibull and Gaussian Distribution Analysis • To develop suitable identification markers from the features extracted from the PD data to predict the condition of nanofluid insulation • To compare the nanofluid characteristics of both mineral oil and vegetable oils and validate its applicability as an insulating medium for power transformer applications.	• Experimental setup for preparation of nanofluids using magnetic stirrer and ultrasonicator were arranged in the laboratory. • Experimental setup for the measurement of dielectric characteristics and partial discharge characteristics of nanofluids were arranged in the laboratory. • Lab. experiments on measurement of tan delta, volume resistivity, BDV, dielectric constant for nano mineral oil and nano palm oil are so far completed at different concentrations of SiO2 nanofiller such as 0.01, 0.05 and 0.1%wt.
09.	**Dielectric Diagnosis of EHV Bushings using Frequency Domain Spectroscopy (FDS) including cause Identification for Abnormal Conditions of the Bushing**	• To identify Bushings that have high (Tan Delta >0.7), moderate (0.5 < Tan Delta < 0.7) and negative Tan delta values at rated frequency from the in-service power transformers in the TANGEDCO/ TANTRANSCO Grid. • Testing of transformers of various ages using FDS to arrive at a data base. • To measure the variations of Tan	• Testing of bushings, transformers and consequent test results data collection for data base has been initiated.

Sl. No.	Title	Objective	Progress
	Implementing Organization: Tamil Nadu Generation & Distribution Corporation Ltd. (TANGEDCO), Chennai Outlay:Rs.40 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	delta values of such bushings and transformers over a wide range of frequencies. • To establish relationship between Capacitance Ratio at lower frequency (10mHz) and rated frequency (50Hz) with insulation degradation or ageing. • To determine the cause for higher tan delta, negative tan delta, etc. using the FDS technique. • To conduct one or two strip down tests to conclude the findings. • To suggest the replacement strategy for the bushings with high, moderate and negative Tan Delta.	
10.	**Development of Control Strategies for Grid Connected PV System utilizing the MPPT and Reactive Power Capability** **Implementing Organization:** Indian Institute of Technology, Kanpur Outlay: Rs. 31.25 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To design a suitable model of PV system for simulation and performance analysis in Real Time Digital Simulator. • To propose an artificial intelligent based MPPT algorithm for PV System in the changing environment and also in the case of partial shaded conditions. • To develop a forecasting tool for PV power generation. • To analyze performance of the grid connected PV system using MPPT and reactive power capability.	• Model for PV Forecasting has been completed. • Data for PV power output has been collected.
11.	**Investigation on the operation and control of multiple distributed generation sources in micro grid (Phase-II)** **Implementing Organization:** National Institute of Technology Karnataka (NITK), Surathkal Outlay: Rs. 25 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Development of new techniques for islanding detection of the microgrid and investigate the performance of the same. Implement the voltage and frequency drop control for load sharing in the microgrid. The study microgrid system consists of photovoltaic system, wind power based DG system and a high speed microturbine. • Development of re-closure method for synchronization of the microgrid with the grid and study the performance of the microgrid in seamless transfer mode of operation. • Development of new strategies to improve the system reliability power quality and study their performance.	• Islanding detection and Re-closure scheme. • Implementation of droop concept for load sharing.

Sl. No.	Title	Objective	Progress
12.	**Development of intelligent relaying scheme for microgrids with DG penetration** **Implementing Organization:** Indian Institute of Technology, Bhubaneswar Outlay: Rs. 28 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Setting up a very accurate model of Power Distribution network (micro-grid) with multiple DG Interface (Wind farm, Photovoltaic, Fuel Cell and Emergency diesel generator). • Development of data-mining based intelligent protection scheme for relaying decision against various fault conditions in the micro-grid with DG penetration at grid-connected and islanded mode using both Real-Time Digital Simulator (RTDS) and power system software programs. • Implementation of DSP/FPGA based intelligent protection relay.	• The power network (micro-grid) has been setup on a simulation bench. The same is being developed on Real-Time Digital Simulator (RTDS). • The wide-area information is collected and the same will be used to build data-mining based models for developing intelligent relaying. • In the same time the communication student is developing IoT based communication system for connecting at least 1 to 2 km distance which is required in case of low voltage micro grids.
13.	**Day ahead Solar Power Forecasting for Indian Climatic Zone** **Implementing Organization:** Central Power Research Institute, Bangalore Outlay: Rs.50 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Development of highly non-linear, evolutionary stochastic models for chaotic processes and linking this knowledge for forecasting the day ahead performance of solar power plants in 10 Minutes time slots. • Computational setup for Data Analysis and Solar Power Forecasting using data from weather stations to be installed covering moderate climatic zone (Bengaluru) and experimental setup of solar power forecasting in CPRI, Bangalore	• Initial studies have been carried out and modelling of data is under progress.
14.	**Characterization of Electric Double Layer Super Capacitor with CNT-conducting Polymers / Metal Oxide Composites and Nano Dielectrics** **Implementing Organization:** R.V. College of Engineering, Bangalore	• To identify electrode materials which are a composite of conducting polymers- carbon nanotubes/metal oxides through literature survey for increased energy density and capacitance • Synthesis and characterization of the composite electrode material • Determine stability of electrode • Study of physical and chemical properties of the materials and identify the best composite material for supercapacitor application	• Conducting polymer Polyaniline/carbon nano tubes and polyaniline/titanium dioxide nano composites were developed by in situ chemical polymerization method. • To understand the formation of Composite Raman Spectroscopic studies were carried out. • Prepared composites were subjected to SEM, TEM studies to know the

Sl. No.	Title	Objective	Progress
	Outlay: Rs.16 Lakhs Start Date: August 2016 Scheduled End Date: July 2018		structural properties. • Prepared composites were subjected to cyclic voltammetry studies to estimate the specific capacitance. • Both the prepared composites showed improvements in the specific capacitance with increase in concentration of CNT and titanium dioxide, compared to pristine polyaniline sample.
15.	**Design, development and deployment of grid interfaced power conversion unit for solar - wind power generation system** **Implementing Organization:** Arunai Engineering College, Tiruvannamalai Outlay: Rs. 3.45 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Extracting maximum power from solar and wind systems and feeding the grid with good quality electrical power. • Design, analysis and experimental validation of Z source converter/ cascaded Z source multilevel inverter for hybrid power generation.	• Design, selection of switch device power, loss/efficiency calculations, simulation and stability studies of proposed Z source converter for solar PV systems were undertaken. • Design, switch device power selection, loss/efficiency calculations, simulation and stability studies of the rectifier bridge converter under variable input conditions for PMSG based wind energy systems were completed.
16.	**Compilation of Data on Latest Technologies in Geological & Geotechnical Investigations and Problems Faced & Mitigation Measures adopted during Execution of Hydroelectric Projects** **Implementing Organization:** Central Board of Irrigation and Power, New Delhi Outlay: Rs.40 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Compilation of a compendium of data and measures taken at various hydroelectric projects with regard to problems faced during project construction & its mitigation methods and also to bring out a publication of advanced tools & techniques and best practices in geological & geotechnical investigation and in enhancing efficiency of project execution.	• Devised and finalized the proposed standard 'Format' for collection of information, data and its presentation, for convenience of easy reference. • Carried out relevant literature survey and collection of data. • Undertaken study of case histories as well as data that had been collected. • Held meetings with the members of constituted technical committee.

Sl. No.	Title	Objective	Progress
17.	**Studies on Development of Guidelines for Best Practices in Water & Waste Usage in Coal Based Thermal Power Plants** **Implementing Organization:** Excellence Enhancement Centre for Indian Power Sector, New Delhi Outlay: Rs.42 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To carryout actual water audit/water balance survey by measurements, water & waste water quality testing, assessment/ identification of leakages & other losses at two power stations in water scarce areas such as Rajasthan and Gujarat. Through the studies attempts would be made to assess the potential water consumption reduction and possible technologies to be adopted for reuse/recycling of waste water for plant use for the two stations under study. The study will also work out cost benefit analysis of the viable options taking into account the opportunity cost/value of water use. It will also try to capture impact of seasonal variations of water quality on plant performance and evolve strategy for optimal water use. • Based on water audit/water balance survey studies at the two identified power stations, guidelines would be developed for conducting water audit/water balance survey and also suggest assessment methodology of potential areas of water consumption reduction, water recycle/reuse at other coal based power stations.	• Literature Survey and data collection are in progress.
18.	**Reduction of Switching Transients in Doubly Fed Induction Machines Used in Large Pumped Storage Plant** **Implementing Organization:** Indian Institute of Technology, Roorkee Outlay: Rs. 23.75 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• The aim of the project is to reduce the switching transients and starting time in doubly fed induction machines (250 MW) used in large Pumped Storage Plants (PSP).	• Various start-up methods to reduce current transients in Doubly Fed Induction Machine (DFIM) with minimum start up time were reviewed and analyzed through simulation/ experimental studies. • Electronic control system has been modelled for energy efficient starting of DFIM and its performance was simulated in MATLAB Simulink environment.

Sl. No.	Title	Objective	Progress
19.	**Development of Smart Grid, Controllers for Hybrid Renewable Distributed Generator for a Stand - alone and Grid-connected Operation Addressing Reliability and Power Quality Issues** **Implementing Organization:** National Institute of Technology, Puducherry Outlay: Rs. 35.15 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To develop a new stand alone and grid connected PV and wind turbine generation integrated hybrid system in rural area to supply a quality and reliability power to the load. • To design a smart intelligent controller using FPGA board for an effective power flow management between PV array, wind turbine generator, grid, load and battery. • To design a novel grid tied three-phase PWM inverter utilizing minimum number of switching devices for renewable resources. Verify the various characteristics of the proposed inverter topology with that of general characteristics of an inverter. • To propose a PWM technique that would produce the desired pulses for the proposed inverter. • To develop Artificial Neural Network (ANN) based Maximum Power Point Tracking (MPPT) controller for solar/wind energy system for maximum power tracking. The performance of ANN based MPPT controller to a large extent depends on the type of neural architectures. Thus, the design of ANN based MPPT Controller would involve study of various types of neural architectures. From the investigation, the suitable ANN model is to be identified for MPPT tracking. • To ensure zero Loss of Power Supply Probability (LPSP) and to improve battery bank life, a sizing procedure has been proposed with the incorporation of uncertainties in wind-speed and solar-irradiation level at the site of erection of the plant. • To study the power quality issues of generated renewable energy and the viability of the scheme has been ascertained by performing experimental studies on a laboratory prototype (controller board of power electronic converter). • To propose a Demand Side Management (DSM) in rural area (Karaikal).	• Novel MPPT algorithm is developed using FF algorithm and simulation results are validated in the hardware. • The performance is validated with existing conventional methods.

Sl. No.	Title	Objective	Progress
20.	**Development of solid state transformer as a wind power interfacing device** **Implementing Organization:** National Institute of Technology, Calicut Outlay: Rs.28 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Development of a mathematical model of a Solid State Transformer considering practical data of a Wind Power plant system. • Simulation of Wind Power system interfacing with Solid State Transformer integrated with capability of active power transfer, reactive power compensation, voltage conversion and adaptive protective function. • Design and hardware implementation of a multifunctional Solid State Transformer prototype with scale down parameter. • Experimental verification of Solid State Transformer prototype as a better Wind Power interfacing device using real time data.	• The Solid State Transformer as a wind power interfacing device is designed for 1kVA output. From the various available topologies of solid state transformer, a single active bridge circuit is chosen. The simulation of the proposed circuit is carried out after the complete design of circuit parameters. • Design of controllers for SST has started. Line regulation is done by adjusting the inverter phase shift and the load regulation is from grid side inverter control. Suitable controller has to be designed for this closed loop control. This design process is in progress.
21.	**Erosion-Corrosion Studies on Thermal Sprayed Conventional and Nanostructured Coatings** **Implementing Organization:** Indian Institute of Technology, Madras, Chennai Outlay: Rs.68 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Development of thermally sprayed conventional and nanostructured cermet coatings (Cr3C2-25(Ni20Cr)) and CrN, CrAlN coatings on stainless steel substrate. • Microstructural engineering of cermet coatings and nitride coatings by optimization of process variables. • Micro chemical characterization of the cermet and nitride coatings (Conventional and Nanostructured coatings). • Erosion-corrosion testing of conventional and nanostructured coatings through electrochemical technique. • Tribological characterization of the cermet coatings by Nanoindentation technique.	• A thorough literature survey on the influence of process variables to deposit nanostructured cermet coatings is essential to achieve a desirable influence of nanosized grains in the coatings on the corrosion resistance in aqueous environment (with varying pH). • Stainless steel would be selected as the substrate material. Cr3C2-25(Ni20Cr), CrAlN, CrSiN coatings (conventional and nano) will be deposited on stainless steel substrate by HVOF & LVOF technique. • Phase Identification: XRD will be used to characterize the formation of different phases and their structural features in the coatings deposited on stainless steel substrate.

Sl. No.	Title	Objective	Progress
22.	**Characterization and development of silicone rubber-EPDM Nano composites as outdoor insulating material for EHV applications** **Implementing Organization:** Indian Institute of Technology, Madras, Chennai Outlay: Rs.61 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To develop Ethyline Propylene Diene Monomer(EPDM) -Silicone rubber nanocomposite material (with nano alumina, nano titania as fillers) for outdoor application. • To characterize the nano composite material with different percentage of nano fillers for fundamental electrical, mechanical and thermal properties. • To expose these materials for different environmental conditions (in UV, water, acid, base and slat medium) for different time period (2, 4, 7,15 and 30 days) and study the degradation of the electrical, thermal and mechanical properties. • To develop an analytical tool which will predict the life of the insulating materials.	• Mechanical characterization of silicone rubber/EPDM virgin composites, subjected to various environments, has been carried out. The maximum value of elongation percentage, break load and stress were observed at 40 degree centigrade and 70% relative humidity.
23.	**Studies to improve the performance of fault location algorithm for multi-location shunt fault in transmission line-A case study of Chhattisgarh State** **Implementing Organization:** National Institute of Technology, Raipur Outlay: Rs.27 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• To develop an intelligent fault location algorithm for an existing EHV transmission line of C.G. State based on Soft Computing Technique. • To increase the first zone reach setting and accuracy of fault location estimation. • To reduce outage time, higher efficiency and reliability of the electrical transmission of power. • To improve the fault location diagnostic capabilities during multi-location shunt faults, transforming faults and commonly occurring shunt faults. • To investigate the performance for variation in different fault parameters e.g. fault type, fault location, fault inception angle, fault resistance. • To investigate the performance for real field fault data collected from the state power utilities. • To investigate the impact of High Impedance Faults (HIF), power swing and load encroachment conditions.	• Modelling and design of an EHV transmission line network using MATLAB software and Simpower system toolbox is under progress.
24.	**Development of a dsPIC based efficient system for simultaneous active power sharing and reactive power**	• Design and development of an efficient single-stage power conditioning unit for 2 kWp, 360 V (DC) solar array based Grid-Connected Photo Voltaic System (GCPVS).	• Circuit simulation and dsPIC programming and generating basic triggering signals was undertaken

Sl. No.	Title	Objective	Progress
	compensation in a grid-connected photovoltaic system **Implementing Organization:** Mizoram University, Mizoram Outlay: Rs. 7.10 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Development of a dsPIC based algorithm for automatic active power sharing and reactive power compensation with the capability of maximum power extraction from PV array.	
25.	**Adaptive protection schemes for micogrids with grid - connected and islanded mode of operation** **Implementing Organization:** Indian Institute of Technology, Roorkee Outlay: Rs.30 Lakhs Start Date: August 2016 Scheduled End Date: July 2018	• Real time Simulation of microgrid environment using the Real Time Digital Simulator (RTDS). • Analysis on protection issues of distribution network in the presence of distributed generation systems. • Development of adaptive directional overcurrent relaying scheme for a microgrid system with presence of converter interfaced and rotating machine based renewable energy sources both in grid connected and islanded mode of operation. • Development of adaptive techniques for directional overcurrent relay coordination for both grid connected and islanded mode of operation specifically in the presence of converter interfaced distributed generation. • Validation of the proposed technique using Hardware-In-the-Loop (HIL) test system. • Analysis on effect of size, type and placement of DG on directional overcurrent coordination. • Verification of the proposed technique using the field data.	• IEEE-13 bus system has been simulated using RSCAD software of Real Time Digital Simulator (RTDS).

Completed RSoP Projects

Sl. No.	Title	Objective	Progress
01.	**Common Information Model (CIM) Compliant Power System Network Model Exchange and Naming Schemes for Indian Utilities** **Implementing Organization:** Indian Institute of Technology, Bombay, Mumbai Outlay: Rs.16.16 Lakhs Start Date: January 2015 End Date: November 2016	• To create regional power network models for each of the five Regional Load Dispatch Centers (RLDCs) and one overall National Load Dispatch Centers (NLDCs) network model from 400 KV and above, in CIM compliant format • To allot globally unique reference IDs or master resource IDs to the model elements as per the practices used in CIM. This will be done by proposing methodology for defining naming schemes. • To define a mechanism based on model authority sets, for handling of boundary elements that occur at the regional network boundaries. This mechanism also supports easy merging of regional CIM network models into a national CIM network model. • To design and develop software modules for conversion of network models from proprietary formats to CIM format and vice-versa. • To demonstrate to the utilities how CIM compliant network models can be created and exchanged between control centers or utilities having incompatible proprietary systems. • To define interoperability testing procedures and protocols useful for a national level interoperability testing and accrediting agency, this would play a key role in ensuring that the network models exported by various vendors would be CIM compliant and hence interoperable. • To develop standardized benchmark network models for each region and national network. • To document and publish the experience gained and lessons learned in the exercise.	• Project has been completed and the technical report has been submitted to CPRI.

Sl. No.	Title	Objective	Progress
02.	**Feasibility Studies / Design criteria for HTS Power Transmission Cables and demonstration of a simple Laboratory scale single phase HTS cable** **Implementing Organization:** Indian Institute of Technology, Kharagpur Outlay:Rs.35.52 Lakhs Start Date: January 2015 End Date: March 2017	• Design of HTRS Transmission Cables • Design of cryogenic cooling systems – pressure drop and pumping power refrigeration requirements • Feasibility study on warm and cold dielectric cables • Design of cryogenic terminations/vacuum enclosures • Demonstration of a simple laboratory scale (one metre long) HTS cable	• Project has been completed and the technical report has been submitted to CPRI.
03.	**Understanding the Formation of Copper Sulphide in Transformer Insulation due to Multi - Stress Ageing** **Implementing Organization:** Indian Institute of Technology, Madras, Chennai Outlay: Rs.30 Lakhs Start Date: January 2015 End Date: March 2017	• To understand influence of harmonics current on diffusion of copper sulphide to pressboard insulation and the formation of moisture. • The characteristic variation in partial discharge activity in transformer oil (for different defects which includes particle movement, corona activity, surface discharge and discharges due to floating particle) due to variation in sulphur content. • To know the characteristic variation in permittivity and loss factor of transformer insulation due to ageing of solid insulation by solid insulation in transformer • To understand surface charge behavior of copper sulphide diffused pressboard insulation. • The above study will be carried out with mineral and paraffinic oil to understand the copper sulphide formation and level of diffusion in pressboard insulation.	• Project has been completed and the technical report has been submitted to CPRI.
04.	**FPGA Based Development of Different MPPT Algorithms for a Stand-Alone Photo Voltaic System using Artificial Intelligence** **Implementing Organization:** National	• Development of an improved maximum power point tracking algorithm of a PV system under real climatic conditions • Implementation of the MPPT algorithm by FPGA controller • Development of new NN Controller for maximum power point tracking and experimental verification using FPGA • To investigate the efficiency of the	• Project has been completed and the technical report has been submitted to CPRI.

Sl. No.	Title	Objective	Progress
	Institute of Technology, Karnataka, Surathkal Outlay:Rs.25.07 Lakhs Start Date: January 2015 End Date: March 2017	conventional MPPT and NN base MPPT control. • Designing different intelligent controllers using different types of NN • Realizing NN based MPPT algorithm using FPGA	
05.	**Identification of Incipient Discharges in Transformer Insulation by Elastic Wave Sensing based on Fiber Bragg Gratings** **Implementing Organization:** Indian Institute of Technology, Madras, Chennai Outlay: Rs.35.20 Lakhs Start Date: January 2015 End Date: March 2017	• To simulate various discharges that can occur in transformer insulation and finger print be obtained through fiber Bragg gratings. • By positioning the fiber Bragg gratings at different location, a separate methodology be adopted (by using triangulation technique) to identify the location of discharges. • Design of encapsulation for the fiber Bragg grating sensors to protect it from the harsh environment of a transformer. • Development of a fiber Bragg grating-based multi-channel dynamic interrogator system • Demonstration of incipient discharge identification through elastic wave sensing using fiber Bragg grating sensor/interrogator system.	• Project has been completed and the technical report has been submitted to CPRI.

National Perspective Plan (NPP) Projects

The project proposals under this scheme 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. During the year 2016-2017, seven (07) projects were under progress.

Ongoing NPP Projects

Sl. No.	Title	Objective	Progress
01.	**Integrated sustainable power generation from short rotation forestry enhanced biomass in rural and semi urban areas within clean development mechanism (CO2 mitigation) - R&D initiative for National Biomass Action Plan**	• To identify local species (plantation "short-term forestry") and cultivate them with nutrients of pre-collected and partially treated sewage water for enhanced growth in village/town communities having population not more than 20,000 or equivalent quantity in city on trial basis. • To assess and verify technical feasibility of these species for their	• Mobilization of researchers and partners was completed • Discussion on action and implementation plan was drawn up • Appointment of JRF/SRF and Field Staff was completed • Internal administrative follow-ups possession of

Sl. No.	Title	Objective	Progress
	Implementing Organization: Aligarh Muslim University, (AMU), Uttar Pradesh Outlay: Rs.163.28 lakhs Start Date: April 2014 Scheduled End Date: March 2016 End date by Extension: December 2016 **Note: Project Investigator has requested further extension**	energy value cultivated with sewage nutrients under the Indian conditions and study any adverse effects of sewage water on land (soil). This also includes suitability of land climate fate of nutrients growth pattern and soil acceptability. • To convert enhanced biomass into power through gasifier or boiler on small scale level upto 5 to 10 kW and supply to local grid or transmit to rural areas on pilot basis and its techno-economical evaluation for energy yield and losses • To disseminate the technological interventions through training seminars etc. for its wide full-scale application involving local farmers NGOs and entrepreneurs • To develop a frame work and strategy within CDM measures (UN millennium goals for climate change targets) as an initiative for National Biomass Action Plan involving sustainable issues.	land (2 acres) to set-up pilot plant within university campus was undertaken • Construction of fencing/boundary for the allotted land was completed • Design of experimental set-up (pilot scale) for waste water treatment was undertaken • Procurement of lab equipments were completed • Construction of pilot plant and its commissioning was undertaken • Monitoring of pilot plant is under progress • Design of boiler. Work order for boiler construction and identification of species is underway
02.	**Development of Nano-structures – transformer oil Nano fluids for improvement of thermal and insulating properties** **Implementing Organization:** Bengal Engineering & Science University, Shibpur Outlay: Rs.78.09 lakhs Start Date: November 2014 Scheduled End Date: March 2017 Extension has been sought till September 2017	• Development of synthesis routes for nanoparticles of simple and mixed metal oxides like Al2O3, CaCuTiO3 (CCTO), etc. by wet chemical route and solid state reaction methods • Surface functionalization of the oxide nanoparticles to achieve stable dispersion and suspension in the transformer oil • Study on the insulating property of the nanofluid consisting of the oxide nanoparticles and transformer oil • Study on the thermal conductivity of the nanofluid and explanation of the results	• Preparation of nanofluids and their evaluation has been completed. The results are being analysed.
03.	**Investigations on New Nano – composite materials for Electrical Insulation**	• To investigate on the other metal oxide nanocomposite materials – making and characterization	• Preparation of nano composite materials and fabrication of sheet samples using a roll mixer and hot press has been completed and their properties are being evaluated.

Sl. No.	Title	Objective	Progress
	Implementing Organization: Indian Institute of Technology, Ropar, Punjab Outlay: Rs.65 lakhs Start Date: November 2014 Scheduled End Date: October 2016 End date by Extension: September 2017		• Project has been completed and the technical report has been submitted to CPRI.
04.	**Development of a Selection Methodology for Road header and Tunnel Boring Machine in Different Geological Conditions for Rapid Tunneling** **Implementing Organization:** Central Institute of Mining & Fuel Research, Dhanbad Outlay: Rs.289.20 lakhs Start Date: October 2016 Scheduled End Date: September 2018	• The R&D proposal aims at investigating a scientific selection methodology for performance of Roadheader/Tunnel Boring Machines in different geological and rockmass conditions vis-à-vis their characterization for speedy tunnel operation.	• Project has been initiated • Site selection is under progress
05.	**Development of polymer nano-composites for EHVDC Lines and diagnostics adopting Laser Induced Breakdown Spectroscopy (LIBS)** **Implementing Organization:** Indian Institute of Technology, Madras, Chennai Outlay: Rs.268.41 lakhs Start Date: April 2016 Scheduled End Date: March 2018	• To develop silicone nanocomposite material with nano alumina, titania and with nano micro alumina as fillers with enhanced electrical thermal and mechanical properties to use for EHV DC transmission line insulators. The developed nanocomposite material performance be evaluated by carrying out certain electrical (short time breakdown voltage, permittivity, tan (delta) space charge measurements, pollution performance test by measure of leakage current, tracking test, volume measurement, surface charge accumulation measurement, UHF/SHF signal characterization, thermal (TG-DTA and HDT studies) and mechanical tests (DMA studies, tensile strength, flexural strength, bending strength, impact strength etc.).	• Preliminary studies have been completed

Sl. No.	Title	Objective	Progress
		• Pollution test and ageing test on polymeric materials will be carried out and its performance be analysed. Emission spectra obtained during discharge processes be analysed and ranked for surface severity. • The size and shape of the insulator for 800 kV DC link at first stage analysed by using COMSOL electromagnetic field software and actual insulator be developed using the nanocomposite material and tested for suitability. • The ageing condition of the material will be analysed through Laser induced breakdown spectroscopy- an alternative scheme (for tracking test) for ranking of material ageing.	
06.	**Power Conversion, Control and Protection Technologies for Micro-Grid** **Implementing Organization:** Indian Institute of Science, Bangalore Outlay: Rs.336.00 lakhs Start Date: July 2016 Scheduled End Date: June 2018	• Power converter technologies for reliable and efficient power conversion • Development of advanced digital controller platforms • Advanced control methods for grid-connected converters • Grid emulation with power electronic converters • Modeling, analysis and characterization of photovoltaic panels, batteries and ultra-capacitors • Power electronic topologies and control methods for solar energy. • Modulation and control of induction machines for wind energy • Integration of power converters and storage elements for enhanced ride-through • Parallel operation of power electronic converters and electrical generators • Fabrication and testing of power electronic converters rated between 3kW and 30kW. • Integration of energy sources, storage elements, power converters and electromechanical systems into an experimental micro-grid. • Protection, dynamics and stability analysis of a micro-grid	• Preliminary studies have been completed.

Sl. No.	Title	Objective	Progress
07.	**Low cost silicon rubber insulator** **Implementing Organization:** Raychem RPG Pvt. Ltd., Mumbai Outlay: Rs.141.90 lakhs Start Date: July 2016 Scheduled End Date: June 2018	• Dynamic die header with control systems: Simulation and proto-typing • Silicon Formulation: Rheology suitable for Extrusion (in collaboration with MS University, Baroda) • Extrusion process: Process automation and controls in tune with Header configuration • Extrusion trials: Process optimization, Characterization and demonstration of shed profiles • 11 kV Insulator Prototypes: The proposal aims to demonstrate 11 kV insulators	• Preliminary work and literature survey has been completed

Ongoing IMPRINT Projects under National Perspective Plan (NPP) Schemes

Sl. No.	Title	Objectives
01.	**Development and Application of Small Scale Bending Tests for Residual Property Assessment of High Temperature Materials in Turbines** **Implementing Organization:** Indian Institute of Science, Bangalore **Outlay :** Rs. 221.52 lakhs	The proposal aims to develop a bending creep based technology and the required science for assessment of residual life of materials in power generation, enabling a designer to make intelligent life predictions. The methodology is based on testing miniaturized samples, which will, thereby proffer extracting very small volume of material from in-service components without impairing their integrity or interrupting regular operation. Miniaturized cantilever samples will be micro-machined from virgin and in-service components supplied by BHEL. Bending creep tests on these samples will be performed at high temperatures and various stresses in industrially relevant range for obtaining critical creep parameters, such as stress exponent and activation energy, and establishing microstructure-property relationship. The obtained results from bending creep will be validated against the uniaxial tests using ASTM standard samples. Development of such a small-scale test methodology will be of practical utility in many other branches of materials engineering, including welded joints, cladding and tubes in nuclear reactors which experience varied radiation dosage across their section thickness.
02.	**Design, Development and Control of High-Speed Switched Reluctance Generator for Direct-Coupled Operation with Thermal Turbo-Machinery** **Implementing Organization:** Indian Institute of Science, Bangalore **Outlay :** Rs. 395.00 lakhs	Direct-coupled high-speed turbo-generators (turbine coupled with generator) have higher efficiency and power density than gearbox-coupled conventional turbo-generators. The rotor of a switched reluctance generator (SRG) is suitable for high-speed and high-temperature applications as it is robust, simple, permanent magnet-free, and carries no current. The project seeks to develop high-speed SRG (20 kW/50000 rpm) for thermal turbine based generation. The final prototype would be preceded by two prototypes rated 5 kW/ 10000 rpm and 5 kw/ 50000 rpm, respectively. The project includes design and fabrication of high-speed SRG, structural and dynamic analysis of the high-speed rotor, and electrical performance evaluation of the SRG. The complete design procedure, encompassing electromagnetic and mechanical aspects, will ensure structural robustness, thermal compliance and manufacturability of the high-speed machine in a systematic fashion. The scope includes novel control strategies for high-speed generation, back-to-back operation and position sensor-less operation, besides development of high-switching-frequency power converters.

Sl. No.	Title	Objectives
03.	**Data-driven modeling, analytics, and optimization techniques to manage building thermal demand** **Implementing Organization:** Indian Institute of Technology, Bombay **Outlay :** Rs. 202.00 lakhs	• Reducing energy consumption by improving utilization and reducing wastage, and • Flattening peak-demand through optimal demand-supply matching. But, managing energy demands cannot be left to ad-hoc approaches that depend on human actions: Information and Communication Technologies have a key role to play, through: • Occupancy and needs-based appliance usage, and • Timely demand-response strategies, including appropriate scheduling and resource allocation. The novelty of our approach to smart energy management lies in judiciously combining: • Physics based and data-driven models, • Off-line planning with timely dynamic decision making, and • Minimal physical sensor infrastructure with sophisticated soft sensors (virtual sensors that can replace physical sensors) based on our notion of observability. • Our solutions will be showcased in campus buildings, and subsequently packaged and deployed in our partners' premises.
04.	**Cognition and Control for Demand Management: Sensors, Actuators and Web Services for Smart Consumers** **Implementing Organization:** Indian Institute of Technology, Bombay **Outlay :** Rs. 140.04 lakhs	This project aims to provide hardware-cum-software based solutions for demand management of consumer loads to improve their EE and DR capabilities. Low cost and energy efficient sensor nodes will be developed for gathering relevant information, which would be suitably stored on a server, processed on a web-based platform and accessed through an online interface (computer/mobile phone). Control strategies will be designed to implement EE and DR measures based on user preferences and needs of the grid, and integrated into the web platform to devise the complete solution. The proposed solutions will be reliable, easy-to-use and customizable to facilitate adoption of EE and DR practices. These capabilities will be demonstrated on representative testbeds at IITB.
05.	**Decentralized power generation using micro gas turbines** **Implementing Organization:** Indian Institute of Technology, Kanpur **Outlay :** Rs. 398.96 lakhs	Gas turbines are amongst the most advanced power generation systems as they combine extreme conditions in terms of the rotational speed at an elevated gas temperature. Miniaturization of such a system is not straight-forward as it poses tremendous technical problems, e.g., high rotational speeds and temperature, unfavorable influences on the flow and combustion process, etc. The design will have a single-stage centrifugal compressor mounted back-to-back with a single-stage radial turbine on a common shaft generating 100 kWe. A recuperator will be incorporated to improve the electrical efficiency, whereas an exhaust heat recovery steam generator will be designed to improve thermal efficiency for CHP applications. An electrical efficiency of 25–35% and thermal efficiency of 70-75% for CHP applications are proposed for the MGT systems. Individual component will be tested for performance analysis. A test bed with instrumentation and control systems will be developed for performance analysis of the MGT units.

Sl. No.	Title	Objectives
06.	**Power Converter Design and Implementations for Energy Efficient Applications using Wide-Bandgap Power Devices** **Implementing Organization:** Indian Institute of Technology, Kanpur **Outlay :** Rs. 184.38 lakhs	The proposal envisages the design, implementation, and application of SiC based power converters in modern energy efficient applications. It argues that the currently used converter technology has many shortcomings, which will hinder the usages of SiC based devices in high frequency power converter design especially for high voltage high power applications. Thus, there is a need to synthesize new converter topologies, which will enable us to realize better power processors with higher switching frequency. This will lead to compact, efficient, and high power-density converter modules. The application of the new topologies in energy efficient applications like microgrid, high voltage motor drive, and realization of compact solid-state transformers will also be a part of this research activity.
07.	**Low Cost Indoor Occupancy and Climate Monitoring System For Energy Conservation** **Implementing Organization:** Indian Institute of Technology, Kanpur **Outlay :** Rs. 88.75 lakhs	Air-conditioning load contributes significantly to the energy/electricity consumption by large public institutions, including educational institutions, hospitals, public libraries, government offices, commercial establishments etc. Efficient operation of central Heating Ventilation and Air-Conditioning (HVAC) Systems, can translate into significant savings in energy and costs. Effective monitoring of the occupancy and underlying climatic conditions is required to provide appropriate air conditioning. The main objective of this proposal is to develop a cost-effective monitoring system using programmable hardware paired with platform agnostic web interface to provide actionable user/operator feedback and reporting. This would enable identification, implementation and measurement of impact of energy conservation measures in operation of an air-conditioning system.
08.	**A Software Tool for the Planning and Design of Smart Micro Power Grids** **Implementing Organization:** Indian Institute of Technology, Guwahati **Outlay :** Rs. 202.92 lakhs	Future smartgrids are expected to become interconnected networks of small-scale and self-contained microgrids, which would be an integral add-on to the centralized primary electric power backbone. Since microgrids will mainly focus on supplying electrical and heat loads in a small geographical area with specific climatic conditions (e.g., wind speeds or solar radiation), geographical terrain / water sources, consumer behavior patterns etc., a plethora of design alternatives seem possible depending on the variations in these parameters. The project aims at the development of a design space exploration tool for microgrid design which can provably guarantee a performance measure in terms of say, QoS in electricity, operator revenues, etc. in the face of design perturbations like addition/removal of components (say, generation unit, feeder line or operations control algorithm). New electricity scheduling and operations control algorithms and hardware test bed for a prototype microgrid will also be developed as part of the project.

Ongoing UAY Projects under National Perspective Plan (NPP) Schemes

Sl. No.	Title	Objectives
01.	**Large bed PV smart system for dust mitigation and reliability** **Implementing Organization:** Indian Institute of Science, Bangalore **Outlay :** Rs. 156.91 lakhs	• Dust modeling and analysis, data collection, research and analysis of cleaning and cooling effects in solar PV performance • Conceptualize and formulate a smart cleaning algorithm for optimal performance • Research and develop automated (robotic) system, SPV, for monitoring the performance of a location as well as the health of the panels already located and their cleaning and cooling mechanisms • Electrochemical monitoring unit (EMU) capable of evaluating the corrosion rates of a set of metallic components typically used in solar fields in various atmospheric conditions • Develop smart MPPT integrated cleaning and cooling systems • Smart sited surveyor system, could be used for collecting pre-construction data at new sites • Determining typical soiling rates for forecasting models • Develop large area inspection process using drone

Ongoing UAY Projects under National Perspective Plan (NPP) Schemes

Sl. No.	Title	Objectives
02.	**Development of a high efficiency, high pressure ratio 'Micro Steam Power Pump Block' of 100 kw capacity** **Implementing Organization:** Indian Institute of Science, Bangalore **Outlay :** Rs. 208.00 lakhs	• A highly reliable and efficient steam turbine capable of generating electricity at a very competitive cost. It should have low cost of installation, service and maintenance. • Design of a low pressure condenser operated at 0.1-0.3 bar for the 100kW range of turbine. • Alternative solution for high speed power generation (8000-10000 rpm) • Appropriate selection/design of a water pump • A stable turbine-generator-pump train on a single shaft without gearbox • Design of a robust coupling capable of a engaging and dis-engaging between the generator and the water pump • Option of reheat to improve overall cycle efficiency • Design of 'Daily Start Turbine' and analysis of thermal impact of daily start over the turbine rotor and casing ensuring long life.

Sponsored Projects

Dielectric Materials Division (DMD)

1. **Title : Reduction and Elimination of Polychlorinated Biphenyls (PCBs)-Prioritizing the Power Sector in India**

   Duration : 21 months

   Outlay : Rs.500.00 lakhs

   Sponsoring Organisation: M/s. UNIDO

Brief Objective and Status:

1. Brochures and FAQs on PCBs in different languages such as English, Hindi, Marathi, Malayalam, Kannada, Tamil, Telugu, Odishi, Assamese, Bengali and Gujarati.
2. Site visit, Oil Sampling ,site inspection and testing for PCB concentration
3. PCB Awareness program conducted at site via presentation and distribute the brochures.
4. PCB Owners Training Presentation
5. Inspection of sites and assessments of PCB contaminated oil equipment, storage conditions
6. GPS tracking system has been procured and installed on Volvo truck

2. **Title : PCBs using the Mobile PCB De-chlorination System**

   Duration : 2 years

   Outlay : Rs. 1100.00 lakhs

   Sponsoring Organisation: M/s. UNIDO

Brief Objective and Status:

1. Project titled Management Service for the treatment of Transformer Mineral oil containing PCBs using the Mobile PCB De-chlorination System in India worth Rs.500 lakhs has been awarded to CPRI.
2. A Mobile Dechlorination system costs Rs.1100.00 lakhs sponsored by UNIDO has been received at CPRI. Commissioning and demonstration is in progress
3. PCB decontamination work has been lined by discussion with Utilities such as VISL, MSEB and other Utilities.
4. Several review meetings have been conducted to discuss smooth operation by the system.

Energy Efficiency & Renewable Energy Division (ERED)

3. **Title : BEE motor project**
   Outlay: Rs. 273.05 lakhs
   Sponsoring Organisation: BEE
   Brief Objective and Status: Check testing of Motor

4. **Title : BEE fan project**
   Outlay: Rs.28.314 lakhs
   Sponsoring Organisation: BEE
   Brief Objective and Status: Check testing of Fan

5. **Title : BEE UPS project**
   Outlay: Rs.60.00 lakhs
   Sponsoring Organisation: BEE
   Brief Objective and Status: Check testing of UPS

6. **Title: BEE LED project**
   Outlay: Rs. 354.00 lakhs
   Sponsoring Organisation: BEE
   Brief Objective and Status: Check testing of LED

7. **Title: BEE Illumination project**
   Outlay: Rs. 65.00 lakhs
   Sponsoring Organisation: BEE
   Brief Objective and Status: Check testing of TFL/CFL

Power Systems Division (PSD)

8. **Title: Wide Area Monitoring System (WAMS) using Phasor Measurement Units (PMUs)- NAMPET Phase –II Project**
   Duration: 3 months
   Outlay: Rs.11.00 Lakhs
   Sponsoring Organisation: CDAC, Trivandrum

Brief Objective and Status:

Performance Evaluation of the Phasor Measurement Unit (PMU) developed and fabricated by M/s. CDAC, Trivandrum as part of the NAMPET Phase –II Project on Real Time Simulator (RTS). Performance evaluation is as per IEEE standards C37.118.1-2011 and C37.118.1a-2014 for Total Vector Error (TVE), Frequency Measurement Error (FE), ROCOF Measurement Error (RFE), Magnitude Error (ME) and Phase Angle Error (PE). Validation of the recordings of the signals by PMU for the simulated KSEB system on RTS are also being validated with the field recordings by PMU's installed in KSEB system.

9. Title : **Technical assistance for establishment of Smart Grid test bed**
   Duration : 1 Year
   Outlay : US $692,000
   Sponsoring Organisation: USTDA

Brief Objective and Status:

A grant agreement was signed with USTDA, USA during June 2013 for providing Technical Assistance (TA) services. USTDA floated tender for selection of USA based consultant and the process is in progress. The outcome of TA services will be useful in implementing Smart Grid Research Laboratory project under XII plan.

Information on Patents

The following are the innovative patents filed by CPRI during the financial year 2016-17 in Indian Patent Offices namely, Kolkata and Chennai

During the year 2016-17, a total of 6 Patents have been filed by CPRI. The patents details are listed below: -

Sl. No.	Title of the Patent	Patent Application No.	Date of Filing	Inventors Name S/Shri/Smt./Ms.
1.	Sensor System Replicating and Monitoring Formation of CuxS in High Voltage Power Transformer	201641018693	31.05.2016	Dr.J.Sundara Rajan Mohan.S.Divekar Daisy Flora
2.	High Temperature erosion testing system resistance of metals		Yet to allot patent no. provisional patent application sent to patent attorney on 03.08.2016	R.K. Kumar M. Janardhana Dr. V. Saravanan Dr. M. Shekhar Kumar Raghavendra Naik
3.	Specially designed Porcelain Long Rod Insulators for Highly Contaminated Environment	201641033690	03.10.2016	Dr.N.Vasudev S.Sudalai Shunmugam
4.	Development of Online gas extraction system for dissolved in mineral oils	201741007587	03.03.2017	V.V.Pattanshetti
5.	Successive cooling method to reduce global warming	201741008939	15.03.2017	T.Mallikarjuna Rao
6.	A novel Battery management system for power cum energy supply	201741009033	16.03.2017	M.Siddartha Bhatt

- A product consultancy was given by Materials Technology Division, CPRI, Bangalore to M/s. Vishaka Engineers, Chennai for development of prototype model of heat exchanger (Condenser) based on heat pipe technology. The consultancy value is Rs.1.00 lakh.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 3

EVALUATION & CERTIFICATION

EVALUATION & CERTIFICATION

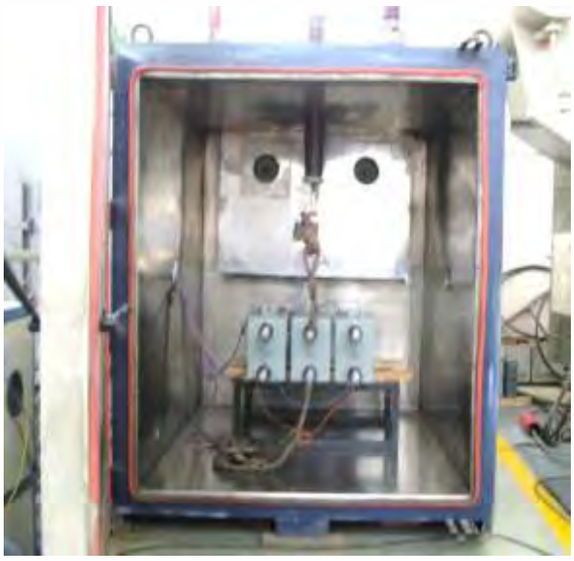
For the past more than five decades, the Institute has been serving the power sector in the field of evaluation and certification. CPRI laboratories are accredited by NABL, ISO17025 & ISO9001-2008, BIS, STL etc. During the year 2016-17, a total of 65725 evaluations were conducted on 23269 samples for 4082 organizations which includes Central, State & Private Power Utilities and domestic and international electrical equipment manufacturers.

First - time Tests

Capacitors Division (CD), Bangalore

HV Capacitors

- Testing and evaluation of HV Shunt capacitors of various ratings ranging from 100kvar, 6.84kV to 1000kvar, 22kV from various organizations as per national and international standards and industry protocols in shortest possible time schedule was carried out.
- Lightning Impulse Voltage Testing and evaluation of 1000kvar, 22kV Fuseless HT Shunt capacitor which was the highest voltage rating tested as per IEC 60871-1-2014, for the first time in Capacitors Laboratory, CPRI, Bangalore
- Testing and evaluation of 7 Nos. of 1.1millifarad, 2.1kV DC capacitors of M/s. ABB AB, Sweden, for the first time in CPRI, Bangalore.
- Testing and evaluation of HV Shunt capacitor of rating 1100kvar,7.3kV, 68 µF as per IEC 60871-1-2014 for thermal stability test which was the highest rating of shunt capacitor manufactured in India and tested for the First time in CPRI, Bangalore, from 25th February to 28th March 2017.



Arrangement for Thermal Stability Test on 1100kvar, 7.3kV, 68 µF Internal Fuse capacitor unit

Arrangement for Lightning Impulse voltage test on 1000kvar, 22kV, 6.9µF Fuseless HT capacitor

Low Voltage APFC Panels

- Tested 510 kvar, 440V APFC panels for temperature rise test and dielectric tests as per IEC 61921 and IEC 61439 on for the first time in CPRI, Bangalore, from 21st October to 10th November 2016. The challenge of performing temperature rise tests on an APFC panel is the panel to be energized to 1.44 times the rated power

which in the present case works out to about 735 kvar and the test current to 816A per phase at a voltage of about 1.2 times the rated voltage. Achieving necessary 3 phase reactive power compensation for the above was the first major challenge. The second challenge was to monitor internal temperature of various components at live points and monitoring the temperature with more than 120 temperature sensors. This is the highest rating of APFC panels tested in the Laboratory so far. This panel was successfully tested and this is beyond the maximum capacity envisaged for testing under the BIS sponsored research project -- Establishment of test facilities for LV APFC panels upto 500 kvar. A view of the tested panel is shown below:

510 kvar, 440 V, LV APFC panel

High Voltage Division (HVD), Bangalore

- Surge Withstand Capability (SWC) test on Control Electronic elements of Auto Recloser as per 62271-III, IEEE Standard C37.60 for the First time in India, for M/s. ABB India Ltd., Nashik.
- Performed Lightning impulse, high current impulse residual voltage and high current impulse withstand test upto 40 kA (2/20us) on Y2 and Y3 EGLA blocks for M/s. CGL, Nasik, on 18th & 19th July 2016.
- The Division has performed lightning impulse residual voltage test, switching impulse residual voltage test and reference voltage test on a 245kV SF6 GIS lightning arrester for the first time in India for M/s BHEL, Hyderabad, on 13th April 2016.
- The Division has developed 40 kA, 2/20µs Impulse Current test setup using the existing Impulse Current

Generator, thereby establishing India's first facility to test Externally Gapped Line Arrester (EGLA) blocks as per IEC 60099-8. This setup was used to perform 40kA High current impulse residual voltage test and 30 kA lightning current impulse residual voltage test on Y2 & Y3 series EGLA blocks for the first time. Representative from M/s. Crompton Greaves witnessed the testing.

Instrumentation Division (ID), Bangalore

- Conformance Certificate issued for LUNA Electronic Electricity Meter, Turkey for test on Conformance to DLMS / COSEM protocol tests in accordance with IEC 62056 on Optical port.

Switchgear Testing & Development Station (STDS), Bhopal

- Mechanical Endurance Test on 220kV Isolator with Earth switch of M/s. Elektrolites Power Pvt. Ltd., Jaipur, was conducted for the first time on 1st May 2016.

New Facilities Created

Dielectric Materials Division (DMD), Bangalore

- The new test facilities are established in Lubricating Oil Laboratory, CPRI, Bangalore for New & Service Turbine and Hydraulic oils for both Mineral and Synthetic oils.

Electrical Appliances Technology Division (EATD), Bangalore

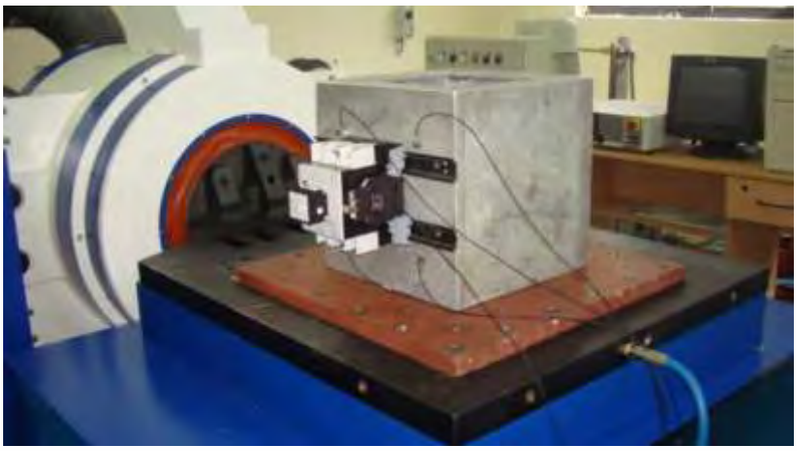
- Up gradation of battery test system: Commissioning of battery test system for the testing higher rating batteries (up to 18 V and 2000 AH) has been added to battery test system at CPRI, Bangalore. Also battery bank test system has been commissioned this year which can test battery bank up to 450 V and 300 A range.

Energy Efficiency and Renewable Energy Division (ERED), Bangalore

- Sun Simulator- Solar PV Module test facility at ERED, CPRI, Bangalore was established recently for testing PV modules

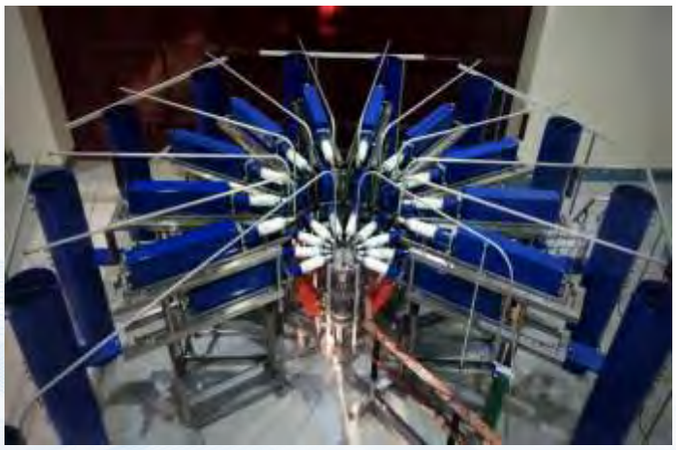
Earthquake Engineering & Vibration Research Centre (EVRC), Bangalore

- Vibration and shock testing facility with 76.2 mm peak to peak displacement has been established



High Voltage Division (HVD), Bangalore

- Commissioning of New Impulse Current Laboratory at CPRI, Bangalore under 12th Plan Project of rating 100kV, 300kJ, which is useful for testing of lightning arrester blocks as per IEC 60099-4. Ed. 3.0.



Instrumentation Division (ID), Bangalore

- CPRI has established comprehensive state-of-art technology 'Metering Protocol Laboratory' at Bangalore and Bhopal units. Static Energy Meters & Smart Energy Meters will be verified for their conformance to DLMS/COSEM (IEC 62056) protocol requirements with the latest CTT tool – CTT 3.X
- CPRI has migrated to the new CTT version CTT3.X for Conformance to DLMS/COSEM (IEC 62056) protocol requirements since1st January 2017.
- Trial tests on various manufacturers for both Static & Smart Energy Meters are carried out at this Division, using CTT3.X for DLMS/ COSEM and Parameter verification as per IS: 15959 (Part 1): 2011, Amendment No.1, July 2014; Amendment No.2, March 2015 and Amendment No.3, January 2016 and the test facility is accredited by NABL.
- Smart Meter testing facilities is added in this Division as per IS:15959 (Part 2):2016 & IS15959 (Part 3): 2017; in addition to Meteorological test facilities including load switch testing of Smart Meter as per IS 16444
- Facility for Testing of Smart Meters as per IS 16444 has been accredited by NABL & BIS
- DLMS Protocol test facility for Smart Meters are accredited by NABL and BIS for their compliance to DLMS/ COSEM (IEC 62056) protocol requirements and Parameter verification as per IS: 15959 (Part 2): 2016, Amendment No.1, April 2017.

Insulation Division & Heat Run Test Laboratory (INS & HRT), Bangalore

- **Cyclic Corrosion Test Equipment**

  A high end Cyclic Corrosion Test facility with SO_2 gas dosing and controls, capable of simulating salt/chemical fog, water fog, dry, direct solution spray in electrolyte, gas injection, controllable variable humidity, controllable variable high temperature, seawater acidified test (SWAAT), "salt spray & drying" and any combination of these tests conditions is procured, installed and commissioned at Insulation Division, CPRI, Bangalore. The instrument meets International Cyclic Corrosion Test Standards viz. ASTM B117, NF C 33-003, BS EN 50483 Parts 2, 3, 4 & 6, DIN 50018, IEC 60068-2-11, IEC 60068-2-52, ASTM D1735, ASTM D2247, ASTM G85 Annex A4, EN ISO 3231, HD323.2.11, ISO9227, DIN EN ISO 6270-2 and VDA-test-621-415 (DIN 5002). Equipment is suitable to carry out commercial tests for Aerial bunched cable accessories, any metal accessories, metals, coatings, paints, plastics reinforced with metal inserts etc.

Cyclic Corrosion Test Equipment at Insulation Division

- **Universal Testing Machine (UTM)**

  Computer controlled Electromechanical Universal Testing Machine, is procured, installed and commissioned at Insulation Division, CPRI, Banglaore to measure tensile load, elongation, compression load & displacement value, compression modulus, flexural strength, flexural modulus, load deflection, peel properties etc. This equipment has the facility to initialize the force & extension to zero point before commencement of any test, mounting different load cells and clamping devices for tensile & elongation test, compression test, flexural strength test, peel test on plastics superimposed on substrate like steel / aluminum wires, Optical fibre and variety of other insulating materials. UTM is equipped with temperature controller Solo-2 for conducting tests in the temperature range of -70°C to 150°C.

Universal Testing Machine at Insulation Division

- **Accelerated Weathering Tester (Fluorescent UV lamps)**

  An accelerated weathering tester using Fluorescent UV lamps is also procured, installed and commissioned at Insulation Division, CPRI, Bangalore. This tester is capable of simulating critical short-wave UV and can realistically reproduce the physical property damage caused by sunlight. Types of damage include color change, gloss loss, chalking, cracking, crazing, hazing, blistering, embrittlement, strength loss and oxidation. This UV test chamber also closely reproduces dew and accelerates its effect using elevated temperature.

  The test chamber can conveniently accommodate up to 48 specimens (75mm x 150mm) and complies with a wide range of international, national, and industry specifications, such as ASTM G151, ASTM G154, ASTM D 4329, ASTM D 4587, ASTM 5208, ISO 4892-1, ISO 4892-3, ISO 11507, AAMA 624 etc. This Division has started commercial testing using this test chamber.

Accelerated Weathering Tester (Fluorescent UV lamps) at Insulation Division

Power Systems Division (PSD), Bangalore

- **OPAL RT SIMULATOR**

The OPAL-RT simulator is a PC/FPGA-based real-time simulator supplied from OPAL RT Technologies, Canada and is well suited for Hardware-in-the-Loop (HIL) testing of equipment, Rapid Control Prototyping (RCP) of systems to design, test and optimize control and protection systems used in power grids and industries.

Following are the Hardware & Software features:

HARDWARE:

(I) OP5707 – Intel CPU based Chassis with 16 Core Processor, Virtex-7 FPGA Processor & I/O Unit

(ii) OP4510 FPGA Processor and I/O Expansion unit, with Quad Core Processor

(iii) I/O modules : (i) Analog Output Modules (ii) Analog Input Module (iii) Opto- isolated Digital Input Module (iv) Opto-isolated Digital Output Module

SOFTWARE (HYPERSIM)

(i) HYPERSIM II Real for real time simulation

(ii) HYPERSIM One-line diagram editor

(iii) HYPERSIM Test View Test Automation Software and Scope view

(iv) IEC 61850 GOOSE & Sample Value Messaging Support

(v) IEC 60870 104 slave for telecontrol of electric power transmission systems,

(vi) C37.118 slave (SEND & RECEIVE) communication for PMU interface

(vii) Driver DNP3 communication support

(viii) MMC Application Support for FPGA based multi-modular converter simulation

(ix) DLMS support

OPAL RT Simulator

- **6135A/PMUCALPHASOR MEASUREMENT UNIT TESTING & CALIBRATION SYSTEM**

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

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

PMU Calibrator

- **Upgraded Real Time Digital Simulator (RTDS)**

The existing Real Time Digital Simulator from M/s. RTDS Technologies, Canada (used since 2003, for all real time simulation studies and Hardware in loop testing) has been updated with the latest processor cards, firmwares and I/O cards to facilitate large system simulation with latest power system components - LCC and VSC-based HVDC, MMC (Multi Modular Converters), HVDC schemes, Phasor Measurement Unit, distributed energy sources (micro grids), smartgrid and renewable energy related concepts etc.

Real Time Digital Simulator (RTDS)

- Routine Test Facilities for Distribution Transformers upto 11 kV, 1MVA rating have been established except for IOV test at RTL-CPRI, Noida. The facilities created are also accredited by NABL.

Regional Testing Laboratory (RTL)-CPRI, Noida

Following new test facilities have been recently established in the Centre:

New GC with Gas Extraction Apparatus
Transformer under Temperature Rise Test
New Energy Meter Test Laboratory

New GC with Gas Extraction Apparatus

Transformer under Temperature Rise Test

New Energy Meter Test Laboratory

New Products Tested

Special Tests Conducted

Capacitors Division (CD), Bangalore

- Environmental Test

  Testing of 38 kV, 1200A, 16 kA autorecloser was taken up in the lab at the request of a customer, from 21st to 23rd September 2016. The test was to conduct a composite temperature humidity test and simultaneously measure the voltage and current accuracy without interrupting the environmental test at various test conditions. As the test had to be conducted at very high RH of 95% and very low temperature of minus 40°C and the risk of high voltage flashover are very high when the samples are tested at these test conditions. Suitable test arrangements were made to safely energize the test sample for doing accurate measurements of voltage in all the three phases of the auto recloser under high humidity conditions, high temperature and low temperature conditions upto 26.4kV inside the test chamber. Further arrangement were also made to pump current upto to 1250A unit on the same assembly without interrupting the environmental test conditions. All the above arrangements were made with internally sourced materials from scrap, etc. without any investment using the existing infrastructure. A view of the autorecloser tested is shown below:

A view of the tested 38 kV, 1200A Autorecloser

Instrumentation Division (ID), Bangalore

DLMS Protocol tests are carried out on Static meter with four ports (RS232, RS485, Optical & Ethernet) as per IS: 15959 (Part 1): 2011, Amendment No.1, July 2014; Amendment No.2, March 2015 and mendment No.3, January 2016 at this Division.

Short Circuit Laboratory (SCL), Bangalore

A Special Test i.e. Temperature-rise Test at specified duty cycle (550A for 60 seconds -14 min. off for 4 cycles) was carried out on a 450kW 1P rotor Resistance Panel on 05.11.2016 as per Customer's requirement for M/s. Ohmark Controls Pvt. Ltd., Bangalore.

Regional Testing Laboratory (RTL)-CPRI, Noida

- Verification of Resistance to flame propogation test has been conducted at RTL-CPRI, Noida for 1000V 3-ph sandwich bustrunking in September 2016 for C & S Electric Haridwar, the same has been witnessed by M/s. UL India (P) Ltd., Bangalore.
- Field testing of energy meters at consumers' premises are conducted in coordination with the Public Grievances Cell, New Delhi by RTL-CPRI, Noida. A total of 151 meters were tested over 175 sites spread across New Delhi.

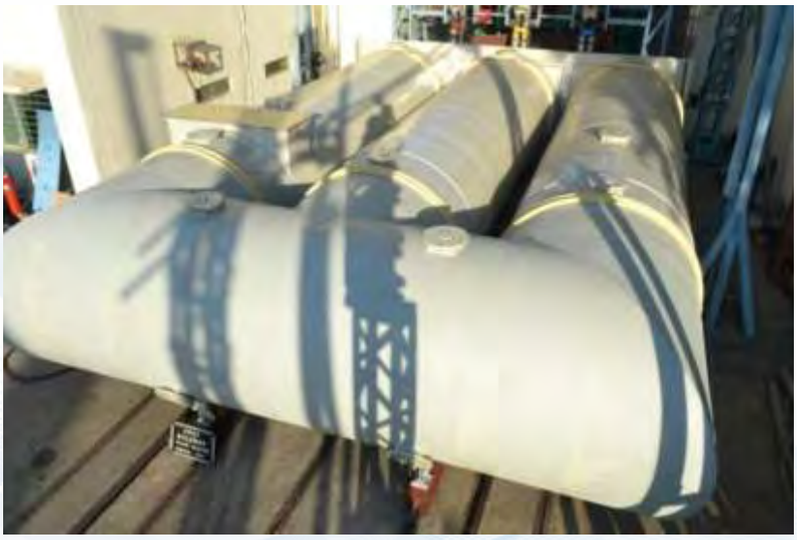
High Power Laboratory (HPL), Bangalore

- 420 kV, Single pole operated single pole gas insulated metal enclosed high speed Earthing switch of gas insulated switchgear (GIS) of M/s. Siemens Ltd., Aurangabad was tested for Induced Current Switching Tests

- 245 kV, 1600 A DBR Disconnector without Earth Switch of M/s. Switchgear Manufacturing Company Pvt. Ltd., Hyderabad was tested for Short-time withstand current & peak withstand current tests

- 30 MVA, 132 / 27.5 kV Single Phase Traction Transformer of M/s. Crompton Greaves Ltd., Bhopal was tested for Ability to withstand the dynamic effects of short circuit

- 26 kV, 30 kA, Isolated Phase Busduct of M/s. Powergear Ltd., Chennai was tested for Short-time withstand current & peak withstand current tests



- 144 kV, Station Class Heavy Duty Surge Arrestor of M/s. CG Power Industrial Solutions Ltd., Nasik was tested for Short Circuit Test.

- 550 kV, Live Tank Current Transformer of M/s. GE T&D India Ltd., Hosur was tested for Short-time current tests

Third Party Inspections:

High Power Laboratory (HPL), Bangalore

- Inspection was carried out at M/s. IMP Power Ltd., Silvassa for 100MVA, Power Transformer for KPTCL/KEC, Bangalore, from 26th to 29th April, 2016.
- Inspection was carried out at M/s. IMP Power Ltd., Silvassa,on 100MVA, Power Transformer for Jammu & Kashmir Power Board, from 25th to 27th May, 2016.
- Inspection was carried out on 20 MVA transformer of M/s. IMP Powers, Silvasa, on 7th June 2016.
- Inspection was carried out to witness temperature rise tests on 2 Nos. of 100MVA, 220/11kV Transformers of M/s. Alstom T&D India Ltd, Allahabad for M/s. KPTCL, from 16th to 27th August 2016.
- Inspection was carried out to witness temperature rise tests on 2 Nos of 12.5MVA, 33/11kV Transformers of M/s. IMP Powers, Silvasa for M/s. KPTCL, from 29th to 1st September 2016.
- Inspection was carried out on 60 MVA, 132/22/11 kV Transformer of M/s Crompton Greaves Ltd., Mumbai, for M/s. TNB, Malaysia from 20th to 29th December 2016.
- Inspection was carried out to witness temperature rise tests on 2 Nos. of 100MVA, 220/11kV Transformers of M/s. Alstom T&D India Ltd, Allahabad for M/s. KPTCL, from 31st January to 12th February 2017.
- Inspection was carried out at M/s. IMP Power Ltd., Silvassa for 12.5 MVA, 66/11 kV, 20 MVA, 66/11 kV, & for 20 MVA, 110/33-11 kV Power Transformer for KPTCL, Bangalore, from 10th to 15th February, 2017.
- Inspection was carried out to witness routine tests on 315MVA, 400/220/33kV Transformer of M/s T&R India limited, Ahmedabad, India, for M/s. APTRANSCO, from 16th to 19th February 2017.
- Inspection was carried out for 125MVAr, 420 kV Shunt Reactor of M/s. Siemens Ltd., Mumbai, for M/s. APTRANSCO, from 21st to 23rd March 2017.
- Inspection was carried out by for 315 MVA, 400/220/33 kV & 500 MVA, 400/220/33 kV transformer of M/s. Toshiba T&D India Pvt Ltd., Hyderabad for M/s. TANTRANSCO, on 24th March 2017.
- Inspection was carried out in M/s. Transformers & Rectifiers, Ahmedabad for 420 kV, 63 MVAr Reactor, on 27th & 28th March, 2017.

Instrumentation Division (ID), Bangalore

- Following Third Party Inspections were carried out on behalf of APEPDCL, Visakhapatnam for the Sample Energy Meter from M/s. Luna Elekrik Elekronik, Turkey for Conformance to DLMS / COSEM protocol tests in accordance with IEC 62056 on Optical port.
    - M/s. AVON Meters Pvt Ltd , Derabassi, Chandigarh (2 inspections)
    - M/s. HPL Electric & Power Pvt Ltd Gurgaon Haryana (2 inspections)
    - M/s. L&T , Mysore
    - M/s. Landis + Gyr , Baddi, HP
    - M/s. Genus Power Infrastructure Ltd, Haridwar
- Following Third Party Inspections were carried out on behalf of PDD, J&K for HDLC layer: 36 test cases, Application Layer: 50 test cases and COSEM Layer: 388 test cases. The Implementation Under Test (IUT) has shown to be conforming to DLMS/ COSEM protocol requirements:
    - M/s. HPL Electric & Power Pvt. Ltd., Gurgaon, Haryana (2 inspections)
    - M/s. L&T , Mysore

Switchgear Testing & Development Station (STDS), Bhopal

- Third party inspection of 36kV, 1250A, 31.5 kA SF6 filled GIS units at the works of M/s. L&T, Ahmednagar, on 6th & 7th April 2016.
- Third party inspection of 1 x 160MVA, 220/132/33 kV, Auto Transformer and 3 x 40 MVA, 132/33 kV Power Transformer at M/s. BHEL, Jhansi along with Engineers from Odisha Power Transmission Corporation Ltd., (OPTCL), Bhubaneswar, from 25th to 30th April 2016.
- Inspection of 5x20MVA, 132/33kV Power Transformer at M/s. Technical Associates Ltd., Lucknow along with Engineers from Odisha Power Transmission Corpn. Ltd., (OPTCL), Bhubaneswar, from 27th December 2016 to 6th January 2017.

Testing & Certification for Overseas Customers

Capacitors Division (CD), Bangalore

- Performance test as per IEEE std. 18-2012 on 19.7 µF, 4 kV, 99 kvar, 1Φ, HT capacitorfor M/s. ABB AB Sweden, from 11th May to 20th June 2016 and from 1st to 12th July 2016
- Type tests as per IEC 60871-2014 & Over Voltage test as per IEC 60871-2014 on 4.77 µF, 11.55 kV, 200 kvar, 1Φ, HT capacitor for M/s. ABB, China, from20th to 30th December 2016 and from 23rd December 2016 to 9th January 2017
- Sine Wave Voltage Test between Terminals & Iron Core, Thermal Stability Test with Thermal Current and Power Losses as per customer's requirement on 3 Φ , 50 kvar, 440 V, 7% Copper detuned reactor, LV, for M/s. Electronic on, GmbH, Germany, from 24th August to 28th October 2016

Electrical Appliances Technology Division (EATD), Bangalore

- Ingress Protection (IP) 66 & IP 55 tests were conducted on Extendable Enclosure & Compact Enclosure, for Polar Switchgear Manufacturing L. L.C. Sharjah- U.A.E., on 31st March 2017
- Ingress Protection 65 tests were conducted on Outdoor Electrical Enclosure for Al Amer Electrical Boards Manufacturing, Dubai- U.A.E., on 16th March 2017
- Ingress Protection (IP) 67 & IP 68 tests were conducted on Cross Bonding Link Box, for Al-Shahrani Group for Contracting. Riyadh, K.S.A., on 1st February 2017.
- Ingress Protection (IP) 55, IP 66 & IP 65 tests were conducted on KIK Free Standing Modular Enclosure, Wall Mounting SS Box and Wall Mounting MS Box, for KIK Lanka (Pvt.) Ltd. Srilanka, 6th February 2017.
- Ingress Protection 55 tests were conducted on Enclosure 1000X800X300 and Enclosure 2000X800X800, for Energo Control Co W.L.L., Kingdom of Bahrain, on 24th October 2016.
- Ingress Protection 54 tests were conducted on 250A SMDB, 400A SMDB & 1000A SMDB, for M/s. UL-Underwriters Laboratories LLC-Dubai Science Park, on 2nd September 2016.
- Ingress Protection -55 tests were conducted on Sheet Metal Enclosure, for Abaft Middle East Transformer Industry LLC., Sharjah- U.A.E., on 9th September 2016
- Ingress Protection -54 & IP- 4X tests were conducted on PRIMAS – Section – 1 & Section 2, for Prime Electrical, Dubai, on 3rd June 2016
- Ingress Protection-54 tests were conducted on Battery bank enclosure (Single well & Double Well), for Corrosion Technologies Services Middle East L.L.C., Sharjah- U.A.E., on 28th April 2016.
- Ingress Protection -43 tests were conducted on 400A Drawout MCC Panel, for Moonstar Electrical Switchgear Manufacturing LLC. Dubai, on 28th April 2016.
- Ingress Protection -55 tests were conducted on 1600A Main Distribution Board, Section – 1 & 2, for Silus Electrical & Switchgear LLC. U.A.E. on 20th April 2016.

Earthquake Engineering & Vibration Research Centre (EVRC), Bangalore

- Seismic qualification tests on 415 V, 2500 A Low voltage switchboard panel for M/s. Dorman Smith Switchgear L.L.C, Dubai, UAE, was carried out on 28th February 2017.

- Seismic qualification of 11 kV switchgear assembly with vacuum circuit breakerand 7.2 kV switchgear assembly with vacuum contactor for M/s. Al-Ahleia Switchgear Co., Kuwait, was carried out on 28th February 2017 & on 14th March2017.

- Seismic qualification of 3 MVA, 33/0.4 kV, 3Phase, Oil immersed transformer for M/s. LTL Transformers (Pvt) Ltd., Sri Lanka, was carried out on 13th March 2017.

High Power Laboratory (HPL), Bangalore

- 3 MVA, 33/0.4 kV 3-Phase Transformer of M/s. LTL Transformers Pvt. Ltd., Srilanka was tested for Dynamic Ability to withstand short circuit currents, on 27th July 2016.

- 132 kV Cross bonding link box of M/s.Abdullah M.Al.Shahrani Factory Riyadh was tested for Short time withstand current test and peak withstand current test on 22nd February 2017.
- 320 kV Cross bonding link box of M/s.Abdullah M.Al.Shahrani Factory Riyadh was tested for Short time withstand current test and peak withstand current test on 22nd February 2017.
- 3 MVA, 33/0.4 kV 3-Phase Transformer of M/s.LTL Transformers Pvt Ltd., Srilanka was tested for No load loss and Load loss test, Dielectric test, Induced over voltage withstand test on 3rd March, 2017.
- XLPE Cable of M/s.3M Malaysia Sdn. Bhd., Malaysia was tested for Dynamic and Thermal Short Circuit test, on 14th December 2016.

- 400 kV Quadruple Tension String of M/s.Nanjing Electric (Group) Co Ltd., China was tested for Power Arc test on 7th February, 2017.

High Voltage Division, Bangalore

- Testing of Distribution transformer, Lightning Arrester housing, Surge Arrester for Impulse voltage withstand test, Power frequency voltage withstand test, Aging testing, Long duration test, Steep RDB, switching RDB, L I RDB, Pre failing test, Weather ageing test, TOV & SSOD test at High Voltage Division, CPRI, Bangalore, for M/s. Precise Electric Manufacturing Co., Ltd, Thailand, on 16th May 2016, 29th September 2016, 5th October 2016, 26th October 2016, 9th August 2016, 2nd November 2016, 10th November 2016, 2nd January 2017, 24th January 2017 & on 16th March 2017.
- Testing of Distribution transformer for Impulse voltage withstand test for M/s. KTK Electrical Engineering Company Limited, Myanmar, on 23rd December 2016.
- Testing of Load break switch advance controller for Surge withstand test for M/s. Schnieder Electric, Australia, 27th December 2016
- Testing of Distribution Transformer for Impulse voltage withstand test for M/s. AM SGB SDN BHD, Malaysia, on 30th January 2017.
- Testing of Distribution Transformers for Impulse voltage withstand test for M/s. Navana Electronics Ltd., Bangladesh, on 30th August 2016, 31st January 2017, 1st February 2017, & on 7th February 2017.
- Testing of Link box for Impulse voltage withstand test, Power frequency voltage withstand test, DC withstand test for Abdulla Al Shaharani, GRP for Contracting, KSA, on 2nd February 2017.
- Testing of Optimization of grading ring design, Composite Insulators for Optimization of grading ring test, Tracking & Erosion test, Water diffusion test Dye penetration test for M/s. Non Jing. Electric (Group) Co. Ltd. China, on December 2016, January 2017, 20th February 2017, 27th February 2017 & on 10th March 2017.
- Testing of Silicon Rubber for Recovery of hydro phobicity test for M/s. Dongguan Nanju Polymer Materials Co. Ltd., China, on 22nd March 2017.
- Testing of Distribution Transformer for Impulse voltage withstand test for M/s. LTL Transformers Pvt. Ltd., Sri Lanka, on 7th March 2017.
- Testing of Distribution transformer for Impulse voltage withstand test for M/s. Emirates Transformers and Switchgears Ltd., Dubai, on 17th March 2017
- Testing of Elbow Arresters for High Current Short duration test, Reference Voltage test for M/s. Richards Manufacturing Works, New Jersey, on 17th October 2016 & on 21st December 2016.
- Testing of ESE Air terminal for Impulse current withstand test for M/s. P T Zeus Prima Garda Lightning Protection Company, Indonesia, on 21st June 2016
- Testing of Distribution transformer for Impulse withstand test for M/s. Protec Electronics Ltd., Dhaka, Bangladesh, on 25th April 2016
- Testing of Impulse withstand test for Current Transformer for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, on 12th April 2016 & on 24th August 2016.
- Testing of Impulse voltage withstand test, power frequency voltage withstand test for Composite cross arm for M/s. VSD Auto machine SDN BHD, Malaysia, on 28th April 2016.
- Testing of Impulse voltage withstand test for Distribution transformer for M/s. Techno Venture Ltd., Dhaka, Bangladesh, on 27th May 2016.

- **Testing of Impulse voltage withstand test for Distribution transformer for M/s. ACME Electronics Ltd., Dhaka, Bangladesh, on 1st August 2016**
- **Testing of Impulse voltage withstand test for Distribution transformer for M/s. Sena Kalyan Electric Industries, Chitagauv, Bangladesh, on 26th, 30th & 31st August 2016.**
- **Testing of Impulse voltage withstand test for Distribution Transformer for M/s. Powermann, Bangladesh, on 29th August 2016.**

Instrumentation Division (ID), Bangalore

- Testing of 3 phase static meter as per IEC62053-21 for M/s Feka construction Co, Turkey, on 2nd & 3rd June 2016 for the following tests:

  Test of limits of error

  Test of Meter constant

  Test of Starting

  Test of No load

- Testing of 1 phase static meter as per IEC62052-11 , IEC62053-21 & additional tests as per customer requirement on for M/s Jamuna Meter Industries, Dhaka, from 10th to 14th September 2016 for the following tests:

  Impulse voltage test

  DC & even harmonics test

  Test of resistance to heat & fire

  Test of Starting

  Frequency variation

  High magnetic influence tests

  Tamper tests

  Verification of no. of elements

Insulation Division & Heat Run Test Laboratory (INS & HRT), Bangalore

- Resistance to tracking and erosion test on outer Sheath of 35 kV spaced Aerial Cable 50 mm2 for M/s. Phelps Dodge International (Thailand) Limited, Thailand
- Resistance to tracking and erosion test on fibre glass/composite cross arm for M/s. Mailva Engineering Sdn. Bhd, Malaysia
- Dry arc resistance test on Silicone Rubber HTV grade for M/s. Dongguan Nanju Polymer Material Co. Ltd., China
- Temperature rise test on 433V, 50Hz, 1600A LV Board/Feeder Pillar for M/s. EWT Transformer Sdn. Bhd., Malaysia
- Temperature rise test on 415V, 50Hz, 2500A LT Panel for M/s. Energo Construction Co., Kingdom of Bahrain

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

- 400kV Composite silicone rubber long rod insulator strings were successfully tested for M/s. Jilin Longxin Electrical Equipment Co. Ltd., China, from 27th to 30th December 2016

TESTING FOR UL (Underwriters' Laboratories):

Temperature rise test on 415V, 50Hz, 2500A MDB for M/s. Power Dynamic Switchgear, UAE

Short Circuit Laboratory (SCL), Bangalore

- Conditional short circuit test at 36kA, 25kA & 15kA rms on 250A 415V SMDB as per IEC 61439-1 & 2
- Conditional short circuit test at 36kA, 25kA & 21.6kA rms on 400A 415V SMDB as per IEC 61439-1 & 2
- Conditional short circuit test at 36kA & 21.6kA rms on 1000A 415V SMDB as per IEC 61439-1 & 2
- Conditional short circuit test at 1kA dc on 1000A 26.4V dc pressure switch as per IEC 60947-5-1
- Conditional short circuit test at 15kA rms & 11.5kA rms on 30A 415V PDU as per IEC 61439-1 & 2
- Short time current test at 36kA rms on Terminal Block as per IEC 60947-7-1-1.

Overseas Third Party Inspection Services as STL Member

Third Party witnessing of tests was carried out on 90MVA, 132kV/33kV Transformer at Mechelen, Belgium, for M/s.PT CG Power Systems Indonesia, Indonesia, from 27th June to 7th July 2016 by Shri S Sudhakar Reddy, Joint Director, High Power Laboratory, CPRI, Bangalore who was deputed for the inspection at Indonesia.

TESTING & CERTIFICATION UNDER INTERTEK-ASTA:

- Short Circuit Withstand Testing of current transformer
- Temperature rise test on current transformer
- Internal Arc fault test on cable link of LT switch board
- Short circuit withstand strength test for 50 KA for 1 sec.on Distribution board
- Short time current test on 12 kV, 630A, RMU

- Temperature rise test on 4000A, 690V LT Panel
- Temperature rise test on 3200A, 690V, LT Panel

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 2016-17 are provided in Appendix-9.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 4

CONSULTANCY ACTIVITIES

CONSULTANCY ACTIVITIES

Distribution Systems Division (DSD), Bangalore

The Division is working as Project Management Agency for CESU area of OPTCL for DDUGJY and IPDS works. The approximate cost of the DDUGJY and IPDS works are Rs.535.00 Crores and the Division is monitoring the works for 56 villages and 28 towns in CESU area for 33kV, 11kV line works & 33/11kV substations.

High Voltage Division (HVD), Bangalore

- Measurement of Earth Resistance for M/s. Kontact Consortion, Chennai, during January 2017.
- Earth Resistance measurement at Sharavathi Hydro Power Station from 5th to 7th December 2016.
- Earth Resistance measurement at the site for M/s. BHEL, Noida, from 18th to 20th January 2017.
- Evaluation of earthing system at Mahatma Gandhi Hydro Electric Power Station, KPCL, Jog Falls, from 22nd to 26th March 2017.
- Evacuation of Earthing System for 400kV Bamnauli and Bawana Substations of Delhi Transco Ltd., New Delhi, from 29th November to 3rd December 2016.

Power Systems Division (PSD), Bangalore

- **Relay Coordination Studies for M/s Jawaharlal Nehru Port Trust (JNPT), Navi Mumbai**

  The work involved carrying out short circuit studies for determining the fault levels at various buses and relay coordination studies to achieve coordinated relay settings in the JNPT Port electrical system (220 kV, 33 kV and 3.3 kV system) comprising of JNPT, Gateway of Terminals (GTI), Nhava Sheva International Container Terminal (NSICT), Nhava Sheva International Container Terminal and the upcoming Nhava Sheva (India) Gateway Terminal (NSIGT).

- **System studies for studying the Impact of the High Power Short Circuit Test facility on Grid, NHPTL**

  An online short circuit test facility for testing of transformers is being established by the National High Power Testing Laboratory (NHPTL) at Bina in Madhya Pradesh. This being an on-line test facility at 400 kV / 765 kV Bina bus, system studies were carried out to study the possible impact on the grid in terms of voltage drops, voltage recovery, and stability of the grid (angular deviations) for (a) different transformer ratings proposed to be tested (b) different operating scenarios of the grid such as normal grid and depleted grid (c) test equipment failure conditions. Based on study results for the existing grid strength conditions at Bina and required test currents, recommendations have been made with regard to the ratings of transformers that can be tested online, which has helped NHPTL to obtain clearance for testing from CTU (Power Grid & POSOCO).

- **Reactive Power Compensation studies for Northern region -NRPC, New Delhi**

  Northern Region Power Committee (NRPC) has entrusted Power Systems Division of Central Power Research Institute (CPRI), Bangalore with carrying out the Capacitor Bank requirement for the Northern Region of Indian Grid comprising of Central Transmission Utilities (CTU) (Power Grid/POSOCO) and State Transmission Utilities (STU) of Uttar Pradesh, Rajasthan, Haryana, Punjab, Delhi, Uttarakhand, Himachal Pradesh and Jammu & Kashmir for the years 2017-18 & 2018-19. Based on the study results, additional

requirement of capacitor bank at 132 kV & 220 kV substations for years 2017-18 & 2018-19 has been recommended.

- **SubSynchronous Resonance Studies for Series Compensation on KarchamWangtoo -Kala Amb 400 kV Lines - M/s. Siemens**

  Studies have been carried out to investigate the risk of SubSynchronous Resonance (SSR), if any, occurring in the system due to the installing of Fixed Series Compensation of 40 % by Power Grid Kalamb Transmission Ltd. on each of the lines in the North-eastern region from (a) KarchamWangtoo -Kala Amb 400 kV Line of length 175 km and (b) Sorang to KalaAmb 400 kV Line of length 162 km at Kala Amb Substation for evacuation of power from KarchamWangtoo Hydropower Station. The study has been completed successfully and reports submitted.

- **System Study for the Proposed 4MWp Solar PV Power Plant at B.P. International Airport, Bhubaneswar**

  System Studies have been carried out to study the feasibility of a 5 MWp Solar PV power plant catering completely to meet the power supply requirements of M/s. Biju Patnaik International Airport (BPIA) at Orissa, which is presently drawing power from CESU Grid at 132 kV level. The various studies carried out are (a) power flow studies (b) stability studies (c) short circuit & relay coordination studies for various operating scenarios of BPIA electrical system. Load forecasting studies were also carried out to estimate the load growth of BPIA system for the next five years. The possible connectivity options of the proposed solar power plant at BPIA (i.e. the voltage levels at which solar power can be drawn and injected to the Airport) has also been recommended as part of the feasibility studies.

- **Dynamic Testing of Protection Relays on Real Time Digital Simulator (RTDS)**

  The following protection relays from various relay manufacturers have been tested for its dynamic performance as per the CIGRE document 'Evaluation of characteristics and performance of power system protection relays and protective systems' by Working Group 04 of Study Committee -34 (Protection) on RTDS:

  - Numerical Distance Protection Relay D60 - M/s. GE India Industrial Pvt. Ltd. Bangalore, July 2016
  - Transformer Differential Protection Relay T60 - M/s. GE India Industrial Pvt. Ltd. Bangalore, October 2016
  - Current Differential relay MICOM P546 - Distance protection – M/s. Alstom T&D India Ltd. Chennai, July 2016
  - Current Differential relay MICOM P546 - Differential protection - M/s. Alstom T&D India Ltd. Chennai, July 2016
  - Current Differential relay MICOM P546 - Distance protection for Power Swing Function – M/s. Alstom T&D India Ltd. , Chennai, August 2016
  - Current Differential relay MICOM P546 - Differential protection - for Power Swing Function - M/s. Alstom T&D India Ltd., Chennai, August 2016

- **Wide Area Monitoring System (WAMS) using Phasor Measurement Units (PMUs)- NAMPET Phase –II Project – CDAC, Trivandrum**

  The Phasor Measurement Unit (PMU) developed and fabricated by M/s. CDAC, Trivandrum as part of the NAMPET Phase –II Project, was tested on the Real Time Simulator as per IEEE standards C37.118.1-2011

and C37.118.1a-2014 for Total Vector Error (TVE), Frequency Measurement Error (FE), ROCOF Measurement Error (RFE), Magnitude Error (ME) and Phase Angle Error (PE). The recordings of the signals by PMU for the simulated KSEB system on Real Time Simulator are also being validated with the field recordings by PMU's installed in KSEB system.

- **Protection Audit for Dharasu Power House of UJVNL**

  Protection Audit has been carried out for Dharasu Hydroelectric Power Station (Maneri Bhali Stage I) of Uttarakhand Jal Vidyut Nigam Ltd. (UJVNL) having 4 Nos. 76 MW (0.9 Lag) turbo alternators. The scope of work comprised of (a) Review of protection system of hydro-generator unit control and protection system (b) 220 kV switchyard equipment protection (c) Review of Circuit Breaker and Relay test reports (d) Review of power line carrier channels for speech and protection signaling and (e) Checking healthiness of the DC system. Suitable recommendations have been made for the existing protection devices based on obsolescence of Technology, suitability and healthiness of the various equipment in the 220 kV Dharasu Power House.

- **Protection Audit - Tiloth Power House**

  Third party protection audit has been carried out for Tiloth Power House in Uttara Kashi having three numbers of 30 MW Hydro Generators. The scope of work included the (a) review of implemented protection settings in the generator unit & switch yard (b) relay coordination of different protection schemes in the 220 kV switch yard (c) auditing of healthiness of DC System, PLCC, GPS system and recording systems. Recommendations/suggestions in respect of existing protection devices based on obsolescence of Technology, suitability and healthiness of the various protection devices/equipment in the Tiloth Power House has been made.

- **Protection Audit – DGEN Mega Power Project**

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

- **Project Management Consultancy service for BESCOM**

  The Power System Division continues to provide consultancy services as Project Management Consultant for Smart Grid and Distribution Automation / SCADA/EMS for BESCOM during the year 2016-17. The services offered includes assistance in the preparation of DPR's, preparation of tender documents, evaluation of technical bids, help in FAT, SAT, Integration of equipment etc.

- **Grid Impact Study due to online 350 MVA Short Circuit Transformer Test Facility at CPRI, Hyderabad**

  Feasibility Studies are being carried out to study the impact of the online 350 MVA short circuit test facility that will be coming up at UHV Research Laboratory-CPRI, Hyderabad for testing of 11 kV & 33 kV Class DistributionTransformers. The grid impact in terms of nodal voltage drops in the vanity of Ghanapur Substation is being computed for drawl of the required test short circuit current from the 220

kV Ghanapur Substation of Transmission Company of Telangana Limited (TSTRANSCO) located around 15 km. from the proposed online short circuit test facility at CPRI, Hyderabad.

- **Expert opinion on the SCADA Contract to PGCIL**

  PGCIL has continued to utilize the services of Power Systems Division in providing valuable expert opinion on the SCADA contracts of M/s. GE-HARRIS vis-a-vis M/s. Alstom.

Special Consultancy Activities

Cables & Diagnostic Division (CDD), Bangalore

Carried out Condition Monitoring/Diagnostic Tests on HV equipment & Preparation of DPR for Renovation, Modernization, Life Extension & Upgradation of M/s. Khandong Power House, KHEP, NEEPCO Ltd., Umrongso, Assam.

Capacitors Division (CD), Bangalore

- On- line PD test by acoustic emission technique was carried out on Generator Transformers-as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment. at THDC, Rishikesh, Uttarakhand.
- Condition monitoring of 400kV class EHV circuit breakers at Koteshwar Power station, THDC, Rishikesh, Uttarakhand, as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment.
- On- line PD test by acoustic emission technique was carried out on Generator Transformers-as a part of consultancy work of Diagnostic and condition monitoring of Power station equipment at NHPC, URI Power Station, Gingle, J & K

High Voltage Division (HVD), Bangalore

- Mr U R Sheshagiri Rao, Joint Director, CPRI, Bangalore was a Team Member of the Committee for Investigation of Sharavathi Generating Station fire incident and visited Sharavathi Generating Station, Karnataka from 23rd to 25th February 2016 and conducted a thorough investigation of the causes leading to fire incident, remedial measures with number of meetings held from 23rd March 2016 to 3rd May 2016 and the report was submitted on 3rd May 2016.
- Dr. N Vasudev, Joint Director, CPRI, Bangalore attended Bhopal Dhuk Transmission Ltd., a consultancy work from 11th to 13th April 2016 for M/s. Sterlite Power Grid Ventures Ltd., Bhopal.
- Adequacy of earthing system at five Generating Stations, (viz., Nagjhari, Kandra, Kodasalli, Supa & Ghataprabha) of KPCL, Ambikanagar
- Smt. Kanyakumari, Additional Director, CPRI, Bangalore and Sri Jithin Pauly, Engg. Officer Gr.2, CPRI, Bangalore have submitted report for External Lightning protection of Sharavathi Hydro Electric Power Station for M/s. KPCL during June 2016.
- Consultancy report sent for the pollution mapping of Western Dedicated Freight Corridor (WDFC Phase-I) of M/s. L&T, Jaipur.
- Mr. Rafiq Mathersa, Engg. Officer Gr.3 and Mr. Gobinath G, Engg. Assistant Gr.1 carried out the pollution mapping for Western Dedicated Freight Corridor project of M/s. L&T at Gujarat from 2nd to 8th October 2016 and gave a technical talk on Pollution Mapping to the customers.

- Design of grading ring for 400kV 120kN, 160kN polymer insulator for M/s. Nanjing Electric Group of Corpn., Ltd., China, on 23rd December 2016.
- Design of grading ring for 400kV 120kN, 160kN polymer insulator for M/s. Nanjing Electric Group of Corporation Ltd., China.

Mechanical Engineering Division (MED), Bangalore

- Design Validation / Approval of 660kV D/C PDT (0-150) Tension Pole for M/s. Apollo Power Systems Pvt. Ltd., Bangalore.
- Design Validation / Approval of 50m Lettic Guyed mast for M/s Shah Infra Towers (P) Ltd., Davangere.
- Design Validation / Approval of 66kV D/C PDT (0-150) Tension Pole for M/s. Apollo Power Systems Pvt. Ltd., Bangalore.
- Design Validation / Approval of 400kV D/C (Quad) Tower pile foundation for M/s. L&T, Chennai.
- Design Validation / Approval of 220kV M/C "MB+15m"Type Tower foundation design for M/s. OPTCL, Bhubaneswar.
- Design Validation of 220kV M/C Type MD+15m Tower for M/s. Sharavathy Conductors Pvt. Ltd., Bangalore.
- Design Validation of 66kV M/C Steel Pole for M/s. Jumbo Plastics, Bangalore
- Foundation Design for 220kV M/C Type 'MB' tower for M/s. OPTCL, Bhubaneswar.
- Design Validation of 220 / 110 kV M/C Type "KLA" Tower for M/s. Kothamangalam.
- Design Validation of 400 / 220 kV M/C Type 'MLA', 'MLB' & 'MLC' tower for M/s. KSEB, Shoranur.
- Design of 220 / 110 kV M/C Type "KLB" & "KLC" Tower for M/s KSEB, Shoranur.
- Design Validation of 400/220kV M/C Multi voltage special narrow base tower type "MLS (00-270) for M/s KSEB, Shoranur.
- Design Validation of 110kV D/C DDSS (30-90 Deg.) / Dead End Monopole for M/s. Appollo Power SystemsPvt. Ltd., Bangalore.
- Design Validation of 220kV D/C Type "P1+9m" (0-10 Deg.) Monopole for M/s. Sharavathy Conductors Pvt. Ltd., Bangalore.
- Design Validation of Pile foundation for KUIL Rivers crossing tower 132kV Line in Lakhisarai Dist, Bihar for M/s. K. Ramachandra Rao Transmission & Project (P) Ltd., Hyderabad.
- Design Validation of 220kV D/C 'P1+0' type Pole for M/s. Sharavathy Conductors Pvt. Ltd., Bengaluru

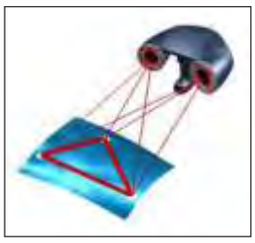
Materials Technology Division (MTD), Bangalore

- **3D laser scanning method to assess the external corrosion spread on water conduit system used in Hydro power plants.**

  Materials technology division (MTD), CPRI, Bangalore recently used a state-of-the-art-technology of Non-Destructive Technique (NDT) in the area of condition assessment of water conduit system (Penstock) used in hydro power plants to predict the exact Remaining life of the Penstock.

  Recently, one of the hydropower plant utility has approached CPRI to conduct the Remaining Life Assessment of the age old penstocks in order to ascertain its healthiness and fitness for further use of these components for continuous operations. MTD has taken up the assignment and during condition

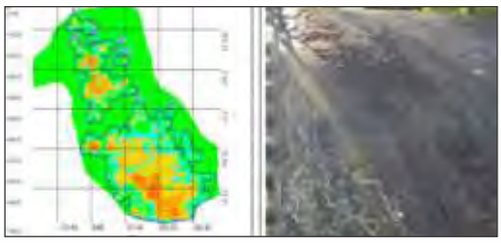
assessment of penstock it was observed that these penstocks were highly corroded on the external surface and with metal losses having helical corroded spread; these corroded regions were difficult to inspect using conventional NDT technique such as Ultrasonic thickness measurement (UT), as it is a spot inspection method. Inspection of corroded Penstock, which is running about 1800 meter length needs extensive surface preparation required more UT machines and technicians and it is a cumbersome process to complete task with in the specified period of time. By considering all these aspects and the importance in arriving the exact remaining life of the corroded penstock system, CPRI employed a state of the art technology called a 3D-Laser scanner (pipe scan) to assess the exact quantum of external corrosion and detected the minimum remaining wall thickness among full length of corrosion spread on helical shaped surface.



3D Laser scanner

Penstock scanning

Laser reflector



Inspection view of scanned helical corrosion

- The 3D-Laser technique has enhanced capabilities of CPRI in the area of condition assessment of penstock to inspect the external corrosion region to predict remaining life. The work was carried out by Mr. M.Janardhana, Joint Director and Mr. G. Kishore kumar, Engg. Officer Gr.4, CPRI, Bangalore for hydro power plant penstock of Kerala State Electricity Board.

Utility Automation Research Center (UARC), Bangalore

- **Smart Grid Consultancy:** CPRI is Project Management Consultant to one of the largest Smart Grid Project supported by Govt. of India for TSSPDCL at Hyderabad. This project is ongoing and field implementation is ongoing which is being executed by M/s.ECIL.
- **SDC PROJECT:** CPRI is the consultant for the R-APDRP SCADA DMS Project carried outat Puducherry, Telangana and for Andhra Pradesh Distribution Companies.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 5

PROMOTIONAL ACTIVITIES

PROMOTIONAL ACTIVITIES

Important Conferences / Workshops Organised

- **9th International Conference on Power Cable Technology - "CABLETECH 2017"**

The Institute organized an International Conference on Power Cable Technology - "CABLETECH 2017" on 9th and 10th February 2017, at CPRI, Bangalore. The Conference provided a platform to Manufacturers, Professionals and the Utility Engineers to share knowledge and experience on the latest state-of-the-art technology on Power Cables. It also dealt with overview of all the elements, as well as the options available for approaching or solving certain aspects related to enhancing electrical performance of insulation materials.

An In-house exhibition was also organised during the Conference and CPRI displayed its facilities and expertise in a stall during the two day Conference. The exhibition was inaugurated by Shri.B.P. Pandey, IAS, Special Secretary, MoP. CPRI stall showcased Research & Development, Testing & Certification, Consultancy/Field Testing facilities and Training activities . Delegates evinced keen interest and sought details of the various unique facilities. Photograph is placed below:

Inauguration of 9th International Conference on Power Cable Technology (CABLETECH-2017) by Shri B P Pandey, IAS, Special Secretary, Ministry of Power, New Delhi held on 9th & 10th February 2017

Inauguration of the Exhibition during International Conference on Power Cable Technology (CABLETECH-2017) held on 9th & 10th February 2017

Director General of CPRI Shri V. S. Nandakumar with Shri B. P. Pandey, I.A.S., Special Secretary, MoP at CPRI stall during CABLETECH - 2017

- **National Conference on "High Voltage Engineering & Technology (NCHVET)"**

  CPRI has organized two day **National Conference on High Voltage Engineering and Technology (NCHVET 2017),** on 27th & 28th January, 2017, at CPRI, Bangalore to provide a common platform to all stake holders viz. manufacturers, utilities, researchers, policy makers, academicians, consultants, testing and O & M engineers to share the latest developments. More than 120 participants attended the conference where more than fifty technical papers were deliberated.

Group photo of delegates of the 2nd National Conference on High Voltage Engineering & Technology (NCHVET - 2017)

- **National Conference on "Emerging trends, Challenges in Transformer Design, Testing & Maintenance"**

  National Conference on "Emerging trends, Challenges in Transformer Design, Testing & Maintenance", organised by Switchgear Testing & Development Station (STDS), CPRI, Bhopal on 3rd & 4th February 2017, at Noor Us Sabah Palace Hotel, Bhopal. There were 250 delegates from all over India for the Conference and 38 technical papers were presented by various organizations like NTPC, Crompton Greaves, Bharat Bijlee, GE, BHEL, Bhopal, Powergrid, Easun MR, Chennai., T&R, Ahmedabad, OPTCL etc. The Chief Guest of the function was Shri A.K. Jha, Director, Technical, NTPC, Shri D.K. Thakur, ED, BHEL was Guest of Honour, Shri Katsutoshi Toda, Chairman, Toshiba gave key note address.

Inauguration of National Conference on emerging trends, challenges in transformer design, testing & maintenance

Awards & Accolades

Smt. A. Amruthakala, Additional Director, Instrumentation Division/HoD, CPRI, Bangalore received "Mylavarapu Subbalakshamma Award", for the best Women Scientist, for year 2016-17. The award was given on the Institute Day Celebration held on 16th January 2017.

Dr. Arun Kumar Datta, Joint Director, STDS-CPRI, Bhopal was awarded with "B. M. Naidu Best Research Paper" on Institute Day Celebration Day held on 16th January 2017 in recognition of his contribution to CPRI based on testing clues/data for the year 2016-2017 for the technical paper titled "Modelling and simulation analysis of static drive for large synchronous machine" Published in: CIGRE Science & Engineering, Cigre, Paris France, Volume No. 4, in the month of February 2016.

Participation in Conferences/Exhibitions

- **NIMA POWER 2016:** Central Power Research Institute (CPRI) participated in the NIMA POWER 2016 held at Nashik, from 27th to 30th May 2016 organised by Nashik Industries and Manufacturers' Association. The Institute put up a stall in the Exhibition and displayed all its unique activities, expertise and credentials in the areas of Research, Testing & Certification. The services offered in the area of Field Testing & Diagnostics, Consultancy, Third party Inspection and Training Programmes were also displayed which attracted a large number of Visitors.

- **Switch – 2016:** Central Power Research Institute (CPRI) participated in Switch Global Expo organized by Federation of Gujarat Industries, at Innovation Technology Dome, Sardar Vallabhai Exhibition Center, Vadodara, Gujarat, from 6th to 10th October 2016. CPRI stamped its presence by setting up a stall and promoted CPRI services at the Exhibition. Footfalls to CPRI stall were more than 500 Customers.

CPRI Officers interacting with Shri Piyush Goyal, Hon'ble Minister of State with Independent Charge for Power, Coal, New and Renewable Energy and Mines, Government of India, at CPRI stall

- **IITF– 2016:** Central Power Research Institute (CPRI) participated in India International Trade Fair (IITF 2016) held at Pragati Maidan, New Delhi, from 14th to 27th November 2016. CPRI stamped its presence by setting up a stall and showcased CPRI services at the exhibition. Footfalls to CPRI stall were more than 600 Customers. Smt. Shalini Prasad, Additional Secretary, Ministry of Power had inaugurated the CPRI stall and appreciated the display of CPRI facilities. Among the other dignitaries visited the stall were, Shri Raj Pal, Economic Adviser, MoP, CMD of Power Finance Corporation, Director (Personnel) of NHPC, Director (Finance), SJUVNL, Member, BBMB etc.

Smt. Shalini Prasad, I.A.S., Additional Secretary, MoP at the inauguration ceremony of CPRI stall

- **"E3"Energise Empower East:** Central Power Research Institute (CPRI) participated in "E3" Energize Empower East, Largest Energy Convention in Eastern India, organized by IEEMA at Milan Mela Ground, Kolkata, from 18th to 20th November 2016. CPRI stamped its presence by setting up a stall and promoted its services at the exhibition. Footfalls to CPRI stall were more than 500 Customers.

- **Vibrant Gujarat Global Trade Show:** Central Power Research Institute (CPRI) participated in Vibrant Gujarat Global Trade Show 2017 on the theme "Connecting India to World", organised jointly by Industrial Extension Bureau (INDEXTb)and Confederation of Indian Industry (CII), held at Exhibition Ground, Nr.Mahatma Mandir, Gandhingar, Gujarat, from 9th to 13th January 2017. CPRI stamped its presence by setting up a stall and showcased CPRI services at the Exhibition. Footfalls to CPRI stall were more than 500 Customers.

CPRI Officers interacting with delegates at Vibrant Gujarat Global Trade Show

- **Intellect 2017:** CPRI participated in Intellect 2017 – Exposition and Confe[re]nce on Intelligent Electricity, organised jointly by IEEE and IEEMA, supported by MoP, from 23rd to 25th January 2017, at India Expo Centre, Greater Noida, NCR Delhi and CPRI stamped its presence by setting up a stall. Hon'ble Minister Shri Piyush Goyal, MoS- Independent Charge for Power, Coal, New and Renewable Energy and Mines in the Government of India visited CPRI stall and conveyed his best wishes for the organization. Footfalls to CPRI stall were more than 300 Customers.

CPRI Officers welcoming Shri.Piyush Goyal, Minister of State with Independent Charge for Power, Coal, New and Renewable Energy and Mines at CPRI stall

- **Middle East Electricity Exhibition (MEE) 2017:** Central Power Research Institute (CPRI) participated in MEE 2017 under Indian Pavilion which was held from 14th to16th February 2017, in Dubai, UAE. It was a great opportunity for networking. It encompassed Conferences, Technical Meetings, Poster Sessions, Exhibition and Social Events. CPRI stamped its presence by putting up a stall and promoted its services in the technical exhibition arena which lasted for 3 days from 14th to 16th February 2017. The technical exhibition was intense in its quality yet it did not lose in its quantity, footfalls to CPRI stall were more than 300. It opened up opportunity to make and maintain contacts with delegates from various Countries like UAE, Saudi Arabia, Oman, Yemen, Iran, Iraq, Turkey, Egypt, Kuwait, Qatar, Germany, UK, Russia, China, Australia, USA, Canada, etc.

  CPRI's stall facilitated in promoting Indian capabilities as a whole and it served as a major meeting point for all the delegates from India. CPRI Officers namely Dr. R. Ramesh Babu, Director, Shri R.A. Deshpande, Additional Director, Short Circuit Laboratory & Shri Anand S, Engineering Officer Gr.3, Information & Publicity Division, CPRI, Bangalore who were deputed for manning the CPRI stall made special presentations to visitors especially M/s. Dubai Electricity and Water Authority (DEWA) Officials and experts from various technical committees during those three days. CPRI officers also participated in technical discussions with many Manufacturers from various countries. Photograph is placed below:

CPRI Officers along with delegates at CPRI stall during MEE 2017

Visits of Important Persons / Foreign Delegations to CPRI

- Mr. Craig Brunk, Sales Director from M/s. Bitrode Corporation, U.S.A visited Electrical Appliances Technology Division, CPRI, Bangalore for Discussion on future R&D and testing of battery based energy storage and requirement for the same, on 17th January 2017.
- Dr. Saurab Kumar, National Project Consultant, PTB, Germany along with Dr. Marco Jung and Dr. Axel Seibel from Fraunhofer-IWES visited Energy Efficiency & Renewable Energy Division, CPRI, Bangalore, to discuss about testing of Grid Tied Inverters, on 7th July 2016.

- Prof. Aman Than Oo, Deputy Head of School for the School of Engineering at Deakin University, visited the Energy Efficiency & Renewable Energy Division, CPRI, Bangalore, to explore the research collaboration between Deakin University and CPRI in the area of Energy (Renewable Energy and Smart Grids), on 19th July 2016.

- Mr. Schweiger Konrad from Austria visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore, for demonstration of High end Data Acquisition System represented by M/s. Enviro Sense Tech, Bangalore, on 29th & 30th June 2016.
- Mr. Heung Lyul from Korea visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore, for Referring Discussion regarding Uni-axial System represented by M/s. Adams Technologies Pvt.Ltd., Bengaluru, on 13th July 2016.
- Mr. Stuart Philip from U.K. visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore, to discuss & explain the features of Tri-axial Seismic Vibration System organized by M/s. Sams Advanced Climatic Tech. Pvt. Ltd., Bengaluru, on 24th August 2016.
- Mr. Sailano Carmine from Italiana visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore, for Technical Discussion organized by M/s. Structural Solution Pvt.Ltd., Hyderabad, on 8th February 2017.
- Mr. Toshihiko Kadowaki from Japan visited Earthquake Engineering & Vibration Research Centre, CPRI, Bangalore, to discuss about the products (Testing system shake table) organized by M/s. ABV Engineers & Consultants Pvt. Ltd., Chennai, on 9th March 2017.
- Mr. Syarif Hidayat, Mr. Chandra Soemitro and Mrs. Vivien M. Liando from M/s. P T Zeus Prima Garda, Indonesia witnessed the impulse voltage measurement (at 40kA, 8/20 µs) on Down conductor cable test for the first time performed by test engineers Dr. N. Vasudev, Addl. Director, Smt. M. Kanyakuymari, Addl. Director & Shri. Jithin Pauly P, Engg. Officer Gr.2 and at Impulse Current Generator Lab., High Voltage Division, CPRI, Bangalore, on 21st June 2016.

- Ms. Violet Kaswii & Mr John Kennedy Malika of M/s Kenya Electricity Transmission Co. Ltd., Republic of Kenya had visited High Voltage Lab., CPRI, Bangalore for witnessing Insulator string test of polymer insulators of M/s NGK – LOKE Polymer Insulators Inc., VA, on 14th September 2016.
- Mr.Tetsuya Masuyama, General Manager for Special Task & Mr. Takehiko Miyauchi, Senior Engineer, Electrical Design Section of Transformer Engineering & Design Department, M/s. Meidensha Corporation, Japan and Mr. Masaki Tatara, Technical Expert (Design) of M/s. Prime Meiden Limited, A.P. visited High Power Laboratory, CPRI, Bangalore with regard to short circuit testing of Scott connected 100 MVA transformer, on 26th April 2016.
- Lr. Chandra W Soemitro, MBA., President & Director, Vivien M Liando, Director of M/s. PT Zeus Prime Garda visited High Power Laboratory, CPRI, Bangalore in connection with testing of 150 kV GIS, on 23rd June 2016.
- Ms.Vandana Singhal, Director, CEA visited Instrumentation Division, CPRI, Bangalore, to review the existing facilities at CPRI, Bangalore for testing of Smart Meters,on 6th October 2016.
- Mr. Azlan Bin Mohamad Saad & Mr. Syahrizan Bin Hassan, From M/s. Tenaga Nasional Berhad, Malaysia and Mr. Teoh Eng Bee, Mr. Qamal Bin Mohamed Mustafa & Mrs. Noorlizayanti Binti Yahaya visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 132kV D/C Type "R23R" Tower with +6m Body & +9m Leg Extension, for M/s. Rohas-Euco Industries Berhad, Malaysia on 20th April 2016.

- Mr. Puad Bin Muhamad & Mr. Mohammed Bukhari Bin Ismail, from M/s. Tenaga Nasional Berhad, Malaysia and Mr. Teoh Eng Bee & Mr. Saiful Hakimie Bin Sulaiman visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on132kV D/C Type "R23T" Tower with +6m Body & +9m Leg Extension, for M/s. Rohas-Euco Industries Berhad, Malaysia on 29th April 2016.

- Ms. Gloria Orare & Mr. Taddeo Mwaura, from M/s. Kenya Electricity Transmission Company Ltd., Republic of Kenya visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 400kV D/C Type "T10BB" (0-10^0) Tower with +6m Body & 4x+4m Leg Extension, for M/s. Kalpataru Power Transmission Ltd., Gandhinagar from 9th to 12th May 2016.

- Mr. Kenala B.X. Kachepa, Mr. Leonard Caleb Machonjo, Mr. Gift Mwambazi & Mr. Alex Kaitane from M/s. ESCOM LTD., Mr. McDonald C. Banda & Mr. Victor Munthali, from M/s. Millennium Challenge Account, Malawi, Mr. Laurentiu Niculae from M/s. Fichtner and Mr. Dominic Leeburn from M/s. Mott MacDonald visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 400kV S/C Type "NST4" (0 Deg.) Towerwith +12m Body & +2m Leg Extension, for M/s. Kalpataru Power Transmission Ltd., Gandhinagar on 26th May 2016.

- Mr. Linus K. Tonui & Mr. Augustine Munyao, from M/s. Kenya Electricity Transmission Company Ltd., Republic of Kenya visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 400kV D/C Type "T30BB" (10^0-30^0) Tower with +6m Body & 4x+4m Leg Extension, for M/s. Kalpataru Power Transmission Ltd., Gandhinagar on 2nd & 3rd June 2016.

- Mr. Ganesh Kumar Sadiappan & Mr. Mohd Nur Azwan Bin Baharuddin from M/s. Tenaga Nasional Berhad (TNB), Malaysia, Mr. Puli Narayana & Mr. Muhammad Fathi from Unimekar – Larico JV and Mr. Muhammad Faiz & Mr. Ahmad Rithaudeen Bin Tajul Amar from Zelleco Engineering Sdn Bhd visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 275 / 132kV M/C Type "2423 PS+0" Steel Pole, for M/s. Arvensis Energy Pvt. Ltd., Hyderabad, Telangana, India, on 11th June 2016.

- Ms. Zhang from M/s. Nanjing Electricals Ltd., China visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 400kV Quad Tension Vibration for M/s. Mosdorfer India Ltd., Mumbai, on 30th June 2016.

- Ms. Anna A. Muhereza & Mr. Mukasa Frederick, from Uganda Electricity Transmission Company Ltd., Uganda. & Mr. Refik Sikalo from M/s. Fichtner GMBH & Co., Germany visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 220kV D/C, 50.3m, Type "PDA+12m" Steel Pole, for M/s. Valmont Structures Pvt., Ltd., Pune, on 6th July 2016.

- Mr. Etim Okon Efiong & Mr. Bonnet Markus from M/s. Transmission Company of Nigeria and Mr. Henry Anayo Nzeribe & Ms. Nwabu Nwosu Chioma from M/s. IPDC – HC Consortium, visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 330kV D/C Type "AAH" Tower for M/s. Arvensis Energy Pvt. Ltd., Hyderabad, Telangana, India, on 14th July 2016.

- Mr. Teoh Eng Bee from M/s. Rohas-Euco Industries Berhad, Malaysia and Mr. Puad Bin Muhamad & Ir. Mohd Yazee Mat Yatim from M/s. Tenaga Nasional Berhad, Malaysia visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 132kV D/C Type "R23MT" (0°-10° Dev.) Tower, for M/s. Rohas-Euco Industries Berhad, Malaysia, on 11th August 2016.

- Mr. Frederick Mukasa, Mrs. Elizabeth Rutwara Kabagambe & Mr. Aloysius Mbonyebyombi from M/s. Uganda Electricity Transmission Company Ltd., Uganda visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 220kV D/C 47.55m, Type "PDB/PST+12m" Tension Steel Pole, for M/s. Valmont Structures Pvt., Ltd., Pune, on 30th & 31st August 2016.

- Ms. Marleenah Ramlee & Mr. Michael Jubily from M/s. Sabah Electricity SDN. BHD., Malaysia. & Mr. K. Naga Raju and Ms. Nur Aima Syarafina from M/s. Larico Infrastructure SDN, BHD., Malaysia visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 275kV D/C Type "SA" Tower with +0m Leg Extension, for M/s. Arvensis Energy Pvt. Ltd., Hyderabad, Telangana, on 14th &15th September 2016.

- Mr. Rusu Ion-Dumitru from Intec Gopa International Energy Consultants, Germany and Mr. Mukasa Frederick from Uganda Electricity Transmission Company Ltd., visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 400kV D/C Type "DA" (0-2 Deg.) Tower for M/s. Kalpataru Power Transmission Ltd., Gandhinagar, on 11th &13th February 2017.

- Mr. Inder Pal Meena from M/s. Rajasthan Rajya Vidyut Prasaran Nigam Ltd., Rajasthan, visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 220kV D/C 72.35m, Tension Pole Type "AP4 (0-5 Deg.) for M/s. Valmont Structures Pvt., Ltd., Pune, on 3rd March 2017.

- Mr. Borhan Bin Siangau & Mr. Bonny Masat from Sabah Electricity Sdn Bhd., Malaysia., Mr. Azlansha ABD Munir & Mr. Mohammad Hirzarul Aizat from LARICO Infrastructure SDN. BHD., Malaysia and Ms. Nur Azwani Binti Ibrahim From Zelleco Engineering Sdn Bhd. Malaysia visited Mechanical Engineering Division, CPRI, Bangalore, for witnessing testing on 275kV D/C Type "LA" Tower with +0m Leg Extension, for M/s. Arvensis Energy Pvt. Ltd., Hyderabad, Telangana, on 27th March 2017.

- Mr. Jeff Ives, Product Manager from M/s Fluke Precision Measurement Ltd.,Norwich, UK visited Power Systems Division, CPRI, Bangalore, India for providing training of Fluke's 6135A PMU calibrator from 20th to 24th March 2017.

- Mr. Michael, Power System Simulation Expert from M/s. Opal RT Technologies, Canada visited Power Systems Division, CPRI, Bangalore, for providing training of Opal RT Simulator, from 13th to 25th March 2017.

- Mr. Nadar Farah, Mr. Raymond M Hayes, Mr. Paul Leufkens, the members from M/s. ESTA International LLC, USA visited Utility Automation Research Centre, CPRI, Bangalore, for the project kick off meeting on 7th November 2016 continued the works, and further Mr. Raymond M Hayes, Ms. Francis Cleveland and Mr. Robert Teichman, M/s. ESTA International LLC, USA and Mr. Raymond Hayes, Mr. Paul J. Zawada, Mr. Miguel Rodas, M/s. ESTA International LLC, USA visited Utility Automation Research Centre, CPRI, Bangalore and had discussions with the CPRI Officers in finalizing specifications for the equipment / systems for the various test beds and delivered lectures on the subject related to smart grid as a part of the assignment. from 9th to 13th January 2017 and on 6th February 2017 respectively. CPRI had entered into grant agreement with United States Trade and Development Agency (USTDA) for availing technical assistance services for the "Smart Grid Test Bed' project and subsequently M/s ESTA International LLC, USA has got appointed for this assignment through bidding.

- CPRI convened a meeting on the behest of the Japanese team request to understand the implementation of Solar Photo Voltaics in India for Energy production and for possible long term collaboration in the areas of Solar Photo Voltaic Inverters, on 7th November 2016. The Japanese delegation included Mr. Hiroki Ichinomiya, Mitsubishi Research Institute (MRI), Mr. Hirofumi Shinohara of JET and Mr. Jun Hashimoto of FREA-AIST. CPRI team was led by Mr. V S Nanda Kumar, Director General, CPRI.

- Mr. Mohammad Fahad Ibna Ilias, Senior Engineer and Mr. Agnelo Gonsalves from M/s. Energypac Engineering Ltd, Bangaldesh visited Short Circuit Lab., CPRI, Bangalore for witnessing the "Short-time current" test at 25kA rms for 3 s with 62.5kA peak carried out on 11kV indoor resin cast Current Transformer as per IEC 61869-1 : 2007 & IEC 61869-2 : 2012 for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, from 18th to 22nd April, 2016

- Mr. Sujan Baidya, Foreman from M/s. Protec Electronics Ltd., Bangladesh visited Short Circuit Lab., CPRI, Bangalore to witness the ability to withstand short circuit tests carried out on 200kVA Three Phase Distribution Transformer as per IEC 60076-5 for M/s. Protec Electronics Ltd., Dhaka, Bangladesh, from 26th to 28th April 2016.

- Mr. Kamarulzaman Bin Hashim, Senior Executive Engineer from M/s. EWT Transformer Sdn Bhd, Malaysia visited Short Circuit Lab., CPRI, Bangalore to witness the "Short-circuit withstand strength" test at 31.5kA rms for 3 s with 66.15kA peak carried out on 433V 1600A LV Distribution Board as per IEC 61439-1 : 2011 & IEC 61439-2 : 2011, for M/s. EWT Transformer Sdn Bhd, Jalan Permata 2, 71800 Nilai, Negeri Senbilan Darul Khusus, Malaysia, on 27th & 30th May, 2016

- Mr. Mohammad Azad Rahman, CEO and Mr. Bimal Kumar Sarker, GM from M/s. Techno Venture Ltd., Dhaka, Bangladesh visited Short Circuit Lab., CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2010 & IEEE C57.12.00 : 2010 on single phase overhead Amorphous Metal Core Distribution Transformers (10 kVA to 75 kVA) from 28th to 31st May, 2016.

- Mr. Alok Bhardwaj, Deputy Manager – International Marketing & Mr. SK Subhani, Engineer from M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd. & Mr. Paul Dyer, Transformer & Switchgear Specialist from M/s. UK Power Networks, West Sussex visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the "Ability to withstand the dynamic effects of short circuit test carried out on 100kVA 11000/250-0-250V Single Phase Distribution Transformer & 200kVA 11000/433V Three Phase Distribution Transformers, for M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd., Medak District, on 23rd & 24th June 2016.

- Mr. H G Yakkundi, DGM – Engg from M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd., Medak District visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short time current test at 40kA rms for 1.0 second with 100kA peak carried out on 245kV outdoor oil immersed live tank Current Transformer for the first time, from 19th to 21st July 2016.

- Mr. Amit Purkait from M/s. Acme Electronics Ltd., Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand short-circuits tests carried out on 250kVA Three Phase Distribution Transformer as per IEC 60076-5 for M/s. Acme Electronics Ltd., Dhaka, Bangladesh on 3rd, 6th & 8th August 2016.

- Mr. S Venkateswaran from M/s. UL India Pvt. Ltd., Bangalore visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short time current test at 36.48kA rms for 1.0 s carried out on Terminal Block as per IEC 60947-7-1 for M/s. Osada Co. Ltd., Tokyo, Japan, on 12th & 16th August 2016.

- Engr. Md. Munirul Alam and Mr. Agnelo Gonsalves from M/s. Energypac Engineering Ltd. Dhaka visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the "Short time mechanical current rating" test at 15kA rms for 1 s with 40.5kA peak carried out on 15kV outdoor resin cast Current Transformer as per ANSI C57.13 – 2008, for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, on 24th August, 2016.

- Major Mohammad Iqbal Hossain (Retd.) – Deputy General Manager and Mr. M. A. Masud Khan – Manager Grade 2 from M/s. Sena Kalyan Electric Industries (SKEI), Chittagong, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2010 & IEEE C57.12.00 : 2010 on Single Phase Overhead Amorphous Metal Core Distribution Transformers (10 kVA to 100 kVA), from 2nd to 12th September, 2016.

- Engr. M. M. Hassan Mamoon - Managing Director & Mr. Sambhu Nath Mondal from M/s. Powermann Bangladesh Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand short-circuits tests carried out on 200kVA & 250kVA Three Phase Distribution Transformer as per IEC 60076-5 for M/s. Powermann Bangladesh Limited, Dhaka, Bangladesh, from 1st to 7th September 2016.

- Mr. Sheikh Mohammad Abu Dawood - DGM & Mr. Pallab Paul from M/s. Navana Electronics Limited, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand short-circuits tests carried out on 100kVA & 250kVA Three Phase Distribution Transformer as per IEC 60076-5 for M/s. Navana Electronics Limited, Dhaka, Bangladesh, from 1st to 8th September 2016

- Mr. CH Rambabu, General Manager – Operations from M/s. Shirdi Sai Electricals Ltd. & Mr. Rodrigo Marques Da Silva, Materials and Suppliers Quality Management from M/s. CEMIG, Brazil visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the "Short circuit test" carried out on 10kVA & 37.5kVA 7967/240-120V Single Phase Distribution Transformers and 45kVA & 300kVA 13.8/0.220-0.127kV Three Phase Distribution Transformers for M/s. Shirdi Sai Electricals Ltd., Kadapa, Andhra Pradesh as per Brazilian Standard NBR 5440,from 17th to 22nd October 2016.

- Mr. K. Kaja John, Manager – Engineering from M/s. Energy Controls Co W.L.L. Kingdom of Bahrain visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Verification of short-circuit withstand strength at 50 kA for 1 second and other verification tests carried out on 415V 1000A LT Panel as per IEC 61439-1 & IEC 61439-2 for M/s. Energy Controls Co W.L.L., Kingdom of Bahrain, on 25th & 26th October 2016.

- Mr. Mohammad Munirul Alam, Senior Engineer from M/s. Energypac Engineering Ltd., Dhaka visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Short-time mechanical current rating test at 15kA rms for 1 s with 40.5kA peak carried out on 15kV Outdoor Resin Cast Current Transformer as per IEEE C57.13 – 2008 for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh, from 24th to 27th October, 2016

- Mr. Babu P Nair, Sr. Quality Surveillance Engineer from M/s. Dubai Cable Company Pvt. Ltd. (DUCAB), Dubai visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Adherence of screen during short circuit temp. - Thermal short circuit test at 21.08kA for 1.0 s through copper conductor carried out on 3 x 120 sq.mm Copper conductor, XLPE insulated steel wire armoured LSZH sheathed 19/33kV Cable as per BS 7835 – 2007 for M/s. Dubai Cable Company Pvt. Ltd. (DUCAB), Dubai, UAE, on 23rd November, 2016.

- Mr. Santhosh, Engineer from M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd. & Mr. Solon Athanasopoulos from Public Power Corporation, Greece visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 160kVA & 250kVA20-15/0.4kV Three Phase Distribution Transformers for M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd., Medak District, from 5th to 8th December 2016

- Mr. Mohammad Munirul Alam, Senior Engineer from M/s. Energypac Engineering Ltd., Dhaka visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the "Short-time mechanical current rating test" at 15kA rms for 1 s with 40.5kA peak carried out on 15kV 15/30:5A Outdoor Resin Cast Current Transformer as per IEEE C57.13 – 2008 for M/s. Energypac Engineering Ltd., Dhaka, Bangladesh on 27th & 28th December, 2016

- Mr. Nilesh Jasani, HOD – Test Field from M/s. AM SGB SDN BHD., Malaysia visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 1000kVA 11/0.433kV Three Phase Oil Immersed Hermetically Sealed Distribution Transformer, for M/s. AM SGB SDN BHD, Arab – Malaysian Industrial Park, 71800, Nilai, Malaysia, on 1st & 2nd February 2017

- Mr. Pallab Paul – Deputy Manager and Mr. Md. Azim Uddin – Asst. Manager from M/s. Navana Electronics Limited, Gazipur Sadar, Bangladesh visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the short circuit and temperature rise test as per IEEE C57.12.90 : 2010 & IEEE C57.12.00 : 2010 on Single Phase Overhead Distribution Transformers (10 kVA to 100 kVA), from 3rd to 15th February, 2017

- Mr. Santhosh, Engineer from M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd. & Mr. Solon Athanasopoulos from Public Power Corporation, Greece visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to withstand the dynamic effects of short circuit test carried out on 250kVA 20-15/0.4kV Three Phase Distribution Transformer, for M/s. Toshiba Transmission & Distribution Systems (India) Pvt. Ltd., Medak District, on 31st January 2017

- Mr. Lalu Kunnath, Manager from M/s. Microsoft Operations Pte Ltd., Singapore and Mr. S Venkateswaran, Sr. Test Engineer & Mr. Maruthi, Project Engineer from M/s. UL India Pvt. Ltd., Bangalore visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Conditional short-circuit test at 11.5 kA rms carried out on 415V 30A Power Distribution Unit as per Customer's test protocol for M/s. Microsoft, Redmond, USA,on 20th & 21st February 2017

- Mr. M.P. Saravanan, Manager – High Voltage Test Laboratory from M/s. Emirates Transformer & Switchgear Limited, Dubai visited Short Circuit Laboratory, CPRI, Bangalore for witnessing the Ability to Withstand the Dynamic Effects of Short circuit, Temperature-rise, Determination of Sound Level & Zero Sequence Impedance tests carried out on 1000kVA 11/0.433kV Three Phase Oil Immersed Distribution Transformer for M/s. Emirates Transformer & Switchgear Limited, Jebel Ali, Dubai, UAE, from 15th to 20th March 2017

- Mr. Md. Zahedul Islam, DGM and Mr. Md. Saiful Isla, Manager visited STDS, CPRI, Bhopal for witnessing the Dynamic short circuit withstand test conducted on 5/6.25MVA, 33/11.55 kV Power Transformer, on 28th July 2016 for M/s. Confidence Electric Limited, Unique Trade Centre, Karw an Bazar, Dhaka, Bangladesh.
- Mr. Md. Zahedul Islam, DGM and Mr. Md. Saiful Islam, Manager visited STDS, CPRI, Bhopal for witnessing the Dynamic short circuit withstand test conducted on (1) 10/14 MVA, 33/11.55 kV, 3- Phase Power Transformer, (2) 100kVA 6.35/0.240kV 1- phase Distribution Transformer, (3) 75 kVA 6.35/0.240 kV, 1- Phase Distribution Transformer, (4) 100kVA, 6.35/0.240kV 1- phase Distribution Transformer, on 4th, 9th & 17th August 2016, for M/s Confidence Electric Limited, Unique Trade Centre, Karwan Bazar, Dhaka, Bangladesh.
- Mr. A.K.M. Mohibul Alam, DGM and Md. Anowarul Islam, DGM. visited STDS, CPRI, Bhopal for witnessing the Short Circuit dynamic withstand test conducted on (1) 10/14 MVA, 33/11.55kV, 3 Phase Power Transformer (OCTC). (2) 5kVA, 6.35/0.240kV single phase Distribution Transformer. (3) 10/14 MVA, 33/11.55kV, 3 Phase Power Transformer (OLTC). (4) 5kVA, 6.35/0.240kV single phase Distribution Transformer, on 3rd, 4th & 14th October 2016, for M/s. TS Transformers Limited, Level – 13B, House No. 21, Road No. 17, Banani C/A, Dhaka – 1213, Bangladesh.
- Mr. Md. Saiful Islam, Manager visited STDS, CPRI, Bhopal for witnessing the Short Circuit dynamic withstand test conducted on (1) 100kVA 6.35/0.240kV 1- phase Distribution Transformer. (2) 75 kVA, 6.35/0.240 kV, 1-Ph Distribution Transformer, 25th October 2016, for M/s Confidence Electric Limited, Unique Trade Centre, Karwan Bazar, Dhaka, Bangladesh.
- Mr. Deepak P.P. visited STDS, CPRI, Bhopal for witnessing the Verification of Short Circuit withstand strength test conducted on 400V, 6300A, 25kA, LV Panel of M/s East & West Factory, P.B. No: 718, Dammam 31421, Kingdom of Saudi Arabia, on 4th January, 2017.
- Mr. Debesh Mondal visited STDS, CPRI, Bhopal for witnessing the test Short Circuit dynamic withstand test conducted on 10MVA, 33/11kV, 3-Phase, Power Transformer of M/s. Energypac Engineering Ltd., Energy Center, 25 Tejgaon I/A, Dhaka – 1208, Bangladesh, on 18th and 19th January, 2017.

- Md. Zahedul Islam, General, Manager & Mr. Nilesh Dhote, Production Engineer visited STDS, CPRI, Bhopal for for witnessing the Short circuit dynamic withstand test was conducted on 10/14MVA, 33/11.55kV 3-Phase, Power Transformer of M/s. Confidence Electric Ltd., Unique Trade Centre (UTC), Level-7, 08, Panthapath, Kawran Bazar, Dhaka – 1215, Bangladesh, on 6th March 2017
- Ms. Nor Hazimah BT Mustafr from M/s Alaf Cekal, SDN. BHD512664-M) No.9, Jalan Hi-tech 3/1, Kawasan Perindustrian Hi-tech 3, 43500 Semrnyih Selangor, Malaysia, visited STDS, CPRI, Bhopal, for witnessing the L.V. Outdoor Feeder Pillar DIN type testing, on 13th April 2016.
- Mr. Mohd. Baker Ahmad Alabbasi, JEPCO & Mr.Jafer Radi, Mohd.Obeidat JEPCO, visited Station-2- STDS-CPRI, Bhopal for witnessing the Short time withstand current test, peak withstand current test on 12kV, 630A 21kA RMU for 3 seconds, for M/s L&T, Ahmednagar, on 30th August 2016.
- Mr. Prateek Taneja, Design Engineer, M/s. PGCIL, Gurgaon representative visited UHVRL-CPRI, Hyderabad for witnessing the Lightning Impulse voltage withstand test, Wet Switching Impulse voltage withstand test, Wet Power frequency voltage withstand test, RIV test, Corona test, Voltage distribution tests conducted on 765kV and400kV Glass Insulator strings, for M/s. YUAIZ, Russia, at UHVRL-CPRI, Hyderabad, from 21st to 27th May 2016

- Ms. Violet K Kaswii and Mr. John K Malika Amwayi of M/s. KETRACO, Kenya visited UHVRL-CPRI, Hyderabad for witnessing the Lightning Impulse voltage withstand test, Dry Power frequency voltage withstand test, Wet Power frequency voltage withstand tests conducted on 400kV Composite insulators strings, for M/s. Mosdorfer India Private Limited, Nasik, India, on 17th September 2016 .
- Mr. Victor Sambula Inganga and Ms. Ruth Kabiri Mburu of M/s. KETRACO, Kenya visited UHVRL-CPRI, Hyderabad for witnessing the Lightning Impulse voltage withstand test, Switching Impulse voltage withstand test, Wet DC voltage withstand test, RIV test, Corona tests conducted on ± 500 kV HVDC insulator strings of 210 kN glass disc insulators with hardware fittings, for M/s. Tag Corporation, Chennai, on 23rd & 24th September 2016.

Important Events

- **Participation in IEC TC 33 meeting at Milan, Italy :** Dr. H N Nagamani, Additional Director and Shri. T. Bhavani Shanker, Joint Director, CPRI, Bangalore participated in the meeting of IEC TC-33 for the year 2016 held from 14th to 16th November 2016, at Milano, Italy. IEC TC-33 deals with Power Capacitors and their applications. Dr. H. N. Nagamani is the Chairperson of IEC TC-33. Shri T. Bhavani Shanker attended the meeting in the capacity of Chairman of Indian National Committee ET-29. The expenditure towards the deputation was sponsored by BIS, New Delhi.

Dr. H N Nagamani, Additional Director at the meeting of IEC TC-33

- Shri S Sudhakara Reddy, Joint Director, CPRI, Bangalore attended the 64th STL-Technical Committee meeting, held at Berlin, on 14th & 15th November 2016.

- **Meeting with IEEMA Switchgear Division:** CPRI held a meeting with IEEMA Switchgear Division at CPRI, Bangalore, on 14th April 2016. The agenda of the meeting is to understand the gaps in test facilities particularly for Switchgear systems. The meeting was chaired by Shri B. V. Raghavaiah, Director, CPRI, Bhopal who briefed the IEEMA members about the current test facilities. The Director also explained about the XI & XII plan projects which will address the Testing Gaps in future.

Shri B.V.Raghavaiah, Director, CPRI, Bhopal chairing the meeting with IEEMA Switchgear Division Members

- **Meeting with Dubai Electricity and Water Authority:** A meeting was held with high level delegation from Dubai Electricity and Water Authority, in New Delhi, on 16th April 2016 to enlist CPRI in DEWA's approved list of laboratories. His Excellency, Mr. Saeed Mohamed Ahmad Al Tayer, MD & CEO of DEWA, UAE agreed for an Audit of CPRI Laboratories for enlistment. This meeting is an effort made by CPRI towards Global acceptance of CPRI certificate.

CPRI Officers and Officers from Dubai Electricity and Water Authority in a meeting in New Delhi

- CPRI was invited by IEEMA for participation in IEEMA International Business Division meeting, held at IEEMA Office in Bangalore, on 2nd December 2016. Shri Prabhakar Hegde, Additional Director, Information & Publicity Division and Shri Anand S, Engg. Officer Gr.3, Planning & Co-ordination Division / Information & Publicity Division from CPRI, Bangalore made a brief presentation of CPRI activities to all the Members.

- **Quality Re-assessment of CPRI laboratories by DEWA:** The Information & Publicity Division, CPRI, Bangalore coordinated the Quality Re-assessment of CPRI Laboratories in Bangalore carried out by Dubai Electricity & Water Authority (DEWA), from 18th to 21st January 2017. Three Officers from DEWA viz., Mr. Ashraf Moatasim, Mgr - Material Inspection, Distribution Power - Tendering & Engineering, Mr. Humaid Al Shamsi and Mr. Joseph Mangalath visited CPRI, Bangalore and made detailed assessment of testing facility of distribution equipment such as MV / LV Power Cables, Oil & Cast resin Distribution Transformers, 12kV RMU, LVDB & MDP and LV Fuse Link.

Opening Meeting by CPRI with DEWA Officials

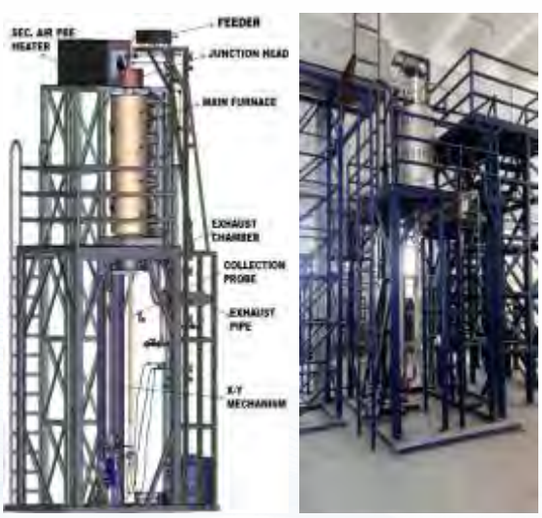
- Bureau of Indian Standards : Mr. S.Vynatheya, Joint Director, Dr. M. Shekhar Kumar, Joint Director, Mr. G. Kishore Kumar, Engg. Officer Gr.4, CPRI, Bangalore brought out two draft standards for magnetic materials. The same has been accepted by BIS and published during August 2016.

  (I) IS 16585:2016 - Magnetic Materials - Specification for Individual Materials - Fe-Based Amorphous Strip Delivered in the Semi-Processed State

  (ii) IS 16586:2016 - Magnetic Materials - Methods of Measurement of the Magnetic Properties of Fe-Based Amorphous Strip By Means Of A Single Sheet Tester.
- The CPRI Officers Mr. R. K. Kumar, Joint Director and Mr. G. Kishore Kumar, Engg. Officer Gr.4, CPRI, Bangalore as CPRI experts witnessed the "Commercial Operation Date (COD)" of unit-1, Yermarus Super Critical Thermal Power Plant. YTPS, RPCL, Raichur, from 4th to 7th March 2017.

Design and Development of First Ever High Temperature Drop Tube Reactor by CPRI for NTPC-NETRA

- CPRI has successfully installed and demonstrated a high temperature (1500°C) Drop Tube Reactor at NTPC-NETRA, Greater Noida. This system was indigenously designed and developed at CPRI as part of the R&D consultancy project sponsored by NTPC-NETRA. The system closely simulates the combustion conditions prevailing in a typical pulverized coal boiler. The combustion reactivity, pyrolysis characteristics and ash deposition mechanisms of coal and coal blends can be studied using this system at different combustion conditions. Outcome of this study is immensely beneficial in optimizing various boiler parameters, while utilizing specific coals/coal blends for achieving improved boiler efficiency and lowering carbon emission.



- Shri J. Santhosh, Additional Director/Unit Head, STDS-CPRI, Bhopal attended the 14th Asian Meeting of High Power Laboratories, held in Xi'an, China, on15th & 16th December 2016.

State Level Painting Competition onEnergy Conservation

- Sri V V Pattanshetti, Additional Director and Dr. M.G. Ananda Kumar, Engg. Officer Gr.4, Training Division, CPRI, Bangalore coordinated the State Level Painting Competition on "Energy Conservation-2016" held at CPRI, Bangalore, on 6th November 2016 which was participated by children from various schools of Karnataka. Sri VV Pattanshetti who is also the Nodal Officer for the Painting Completion on Energy Conservation for the State of Karnataka, attended the National Level Painting Competition on "Energy Conservation" organized by Ministry of Power through Bureau of Energy Efficiency (BEE), held at PMI, NTPC, Noida, on 14th December, 2016 in which three children from Karnataka State Participated. Master Srujan Moolya, Std. V of S.R. Pubic School, Kinnigudde, Udupi, in Category 'A' & Master Satwik D. Amin, Std. IX of Canara High School, Kodialbail, Mangalore in Category 'B' were awarded the BEE consolation prize and felicitated at a function held at Vigyan Bhawan, New Delhi, on 14th December 2016.

State Level Painting Competition on Energy Conservation-2016

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 6

TRAINING ACTIVITIES & PROGRAMMES

TRAINING ACTIVITIES & PROGRAMMES

Seminars / Conferences / Workshops / Training Programmes Organised by CPRI during the year 2016-17

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

Recognizing this need of the Indian power sector, CPRI has been in the forefront amongst many training institutes to disseminate the knowledge, assimilated by way of In-house Research, through technical training programmes organized for:

- Upgrading the working skills of the power sector employees
- Training of personnel from Utilities / Industries/ Clientele from companies in the power sector in relevant skill for their day to day activities.

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

Workshops / Seminars / Conferences / Training Programmes / Tutorials :

Sl. No.	Unit/ Division	Name of the Workshop / Seminar / Conference / Training Programme / Tutorial	Date	Venue
1.	Capacitors Division	Workshop on "Capacitors for reactive power compensation"	2nd & 3rd February 2017	CPRI, Bangalore
2.	Cables & Diagnostics Division	Four days customized Training Programme for O&M Engineers of IOCL, NRPL & WRPL on Diagnostic testing and Condition Assessment of High Voltage Power Equipment	13th to 16th September 2016	CPRI, Bangalore
3.		9th International Conference on Power Cable Technology – CABLETECH-2017	9th & 10th February 2017	CPRI, Bangalore
4.	Dielectric Materials Division	Certificate Course on "Condition Assessment of transformer oil " for DGPC, CHP forChukhha, Bhutan engineers	23rd to 27th, May 2016	CPRI, Bangalore
5.		Certificate Course on "DGA of transformer oil " for DGPC, CHP for Chukhha, Bhutan engineers	8th to 12th August 2016	CPRI, Bangalore
6.		Skill Development in the Area of handling, filling up in Power Equipment and Management of Transformer Oils & Coconut oil based Transformer Oils	19th May, 2016	CPRI, Bangalore
7.		Testing of New & In –Service Transformer Oil, Lubricating oil, Reclamation and Reconditioning of used mineral oils as well as Polymeric composite materials	20th & 21st October 2016	CPRI, Bangalore

Sl. No.	Unit/ Division	Name of the Workshop / Seminar / Conference / Training Programme / Tutorial	Date	Venue
8.	Distribution Systems Division	National Work shop on "Technological Developments & Current Scenario in Power Distribution"	6th March 2017	CPRI, Bangalore
9.	Energy Efficiency & Renewable Energy Division	Two days National Workshop on Energy efficiency Improvements &Case Studies in Water Pumps and Solar Pumping Systems	16th &17th March, 2017	CPRI, Bangalore
10.	Earthquake Engineering & Vibration Research Centre	Tutorial on Vibration Shock and Seismic Testing Equipment	17th February 2017	CPRI, Bangalore
11.	High Voltage Division	2nd National Conference on High Voltage Engineering & Technology (NCHVET)	27th and 28th January 2017	CPRI, Bangalore
12.		Two days Workshop on Grounding Practices	13th and 14th February 2017	CPRI, Bangalore
13.	High Power Laboratory	Emerging Trends in Switchgear Technology and Testing Requirements of LT & HT switchgear & Controlgear.	8th & 9th December 2016	CPRI, Bangalore
14.		Design & Testing requirements of Power / Distribution Transformers	22nd September 2016	CPRI, Bangalore
15.	Instrumentation Division	Latest trends in Energy Metering Technology	25th November ' 2016	CPRI, Bangalore
16.	Insulation Division	National Workshop on Effect of Temperature Rise Test on Electrical Equipment and Characterisation of Dielectric Materials	15th March 2017	CPRI, Bangalore
17.	Mechanical Engineering Division	Seminar on Design and Testing of Transmission Line Components and Accessories (DTTCA-2017)	20th January 2017	CPRI, Bangalore
18.	Materials Technology Division	Workshop on Remaining Life Assessment of Penstock of Sengulam HEP	27th February 2017	M/s.KSEB, Moolamattom
19.		Training Programme on Coal Quality Assessment and Its Impact on Power Plant Performance	23rd & 24th March, 2017	CPRI, Bangalore
20.	Power Systems Division	Training programme on Protection Audit of Indira Sagar Power Station	14th & 15th, July 2016	CPRI, Bangalore
21.		Two days workshop on Smart Grid & Solar Power	25th & 26th August 2016	CPRI, Bangalore

Sl. No.	Unit/ Division	Name of the Workshop / Seminar / Conference / Training Programme / Tutorial	Date	Venue
22.	Power Systems Division	In-house seminar on Trends and Challenges in Electric Utilities Industry: Smart Grid, Micro Grid, HVDC, FACTS solutions using MATLAB & Simulink Software	29th August 2016	CPRI, Bangalore
23.		Workshop on Emerging Trends and Real Time Simulation of Electrical Networks for Smart Grid	21st October 2016	CPRI, Bangalore
24.		Training programme on Impact of Bulk penetration of Renewable Energy Resources on Grid operation & control	10th & 11th November 2016	CPRI, Bangalore
25.		National Conference on Challenges & Issues in operation of Competitive Electricity Markets	8th & 9th December 2016	CPRI, Bangalore
26.		Two days Workshop on Reactive Power Compensation in Power Transmission & Distribution systems	24th & 25th January 2017	CPRI, Bangalore
27.		Two days Workshop on Smart Grid & Cyber security	5th to 6th January 2017	CPRI, Bangalore
28.		Workshop on Generator Protection	9th & 10th January 2017	CPRI, Bangalore
29.		Workshop on Transmission Protection Line	11th & 12th January 2017	CPRI, Bangalore
30.		Workshop on Distribution Protection	13th January 2017	CPRI, Bangalore
31.		Dynamic testing of Numerical Protection Relays using RTDS	14th January 2017	CPRI, Bangalore
32.		Workshop on Smart Grid & Internet of Things (SGIoT)	2nd & 3rd February 2017	CPRI, Bangalore
33.		Two days Workshop on Power Quality challenges with Renewable Energy integration in Smart Grid	23rd & 24th February 2017	CPRI, Bangalore
34.		Two days Training programme on Protection Audit of PSTCL substations and PSPCL Generating Stations	27th & 28th, February, 2017	Ludhiana, Punjab
35.		Two days workshop on Smart Grid & Wind Power	9th &10th March 2017	CPRI, Bangalore
36.		National Workshop on Phasor Measurement Unit (PMU) Calibrator/Tester-A Unique test facility	24th March, 2017	CPRI, Bangalore
37.	Jointly organized by Indian Institute of Technology, Guwahati and R&D Management Division, CPRI	Two day Workshop on Aspects of Fluidized Bed Technology	9th & 10th July 2016	IIT, Guwahati

Sl. No.	Unit/ Division	Name of the Workshop / Seminar / Conference / Training Programme / Tutorial	Date	Venue
38.	Short Circuit Laboratory	Basic Diagnosis of Distribution Transformers in the field during Operation and Maintenance under Skill Innovative Initiative Program	2nd September 2016	Southern Power Training Institute, APSPDCL, Gunadala, Vijayawada
39.		Requirements for Low Voltage Switchgear and Controlgear Assemblies as per IEC 61439	21st October 2016	CPRI, Bangalore
40.		Overview of Direct Online Starters (DOL) functionality and significance in distribution systems	10th February, 2017	CPRI, Bangalore
41.	STDS-CPRI Bhopal	Tutorial Programme on "High Voltage Testing and Measurement Techniques as per National and International standards	7th October 2016	CPRI, Bhopal
42.		National Conference on Emerging trends, challenges in transformer design, testing & maintenance	3rd & 4th February 2017	Noor Us Sabah Palace Hotel, Bhopal
43.		Workshop/Seminar on "Standardisation, Certification, Quality Control order, Testing & Energy Efficiency and Reliability of Distribution Transformers and other related issues, jointly organized by BIS, CPRI-Bhopal, ITMA, & ICAI	10th March 2017	STDS-CPRI, Bhopal
44.	TRC- CPRI, Koradi	Training Program on Boiler tube leakage analysis	13th October, 2016	VIPL, Nagpur
45.	Training Division	Training Programme on Enhancement of Operation & Maintenance Skills for BESCOM Engineer (B-22)	4th to 6th April 2016	CPRI, Bangalore
46.		Training Programme on Enhancement of Operation & Maintenance Skill" for BESCOM Engineers (B-23)	17th to 19th May 2016	CPRI, Bangalore
47.		Training Program on "Distribution Transformers, Lightning Arrestors & Power Cables" for M/s. Ceylon Electricity Board, Sri Lanka	26th August to 2ndSeptember, 2016	CPRI, Bangalore
48.		Residential Induction Training Programme for Assistant Engineers of West Bengal State Electricity Distribution Company Ltd., Kolkata (B-22)	21st November to 12th December, 2016	CPRI, Bangalore
49.		Residential Induction Training Programme for Assistant Engineers of West Bengal State Electricity Distribution Company Ltd., Kolkata (B-23)	6th to 27th March 2017	CPRI, Bangalore
50.	Utility Automation Research Centre	Two days Workshop on Smart Power Technologies	1st & 2nd December 2016	CPRI, Bangalore
51.		Three days Basic Smart Grid Training Programme for Utility Professionals sponsored by NSGM & USAID	14th to 16th December 2016	CPRI, Bangalore
52.		Two days Workshop on "DER and Utility and Security"	12th & 13th January 2017	CPRI, Bangalore

Sl. No.	Unit/ Division	Name of the Workshop / Seminar / Conference / Training Programme / Tutorial	Date	Venue
53.	Utility Automation Research Centre	Two days Workshop on Utility communication and Security	9th & 10th February 2017	CPRI, Bangalore
54.		Workshop on "Advanced Distribution Automation' and presentations delivered by M/s. ESTA International team as a part of USTDA	17th February 2017	CPRI, Bangalore
55.	UHVRL, CPRI-Hyderabad	Training programme on High voltage testing of Electrical Equipment	22nd July 2016	CPRI, Hyderabad
56.		Training programme on Testing of Instrument Transformers in UHVRL	11th November 2016	CPRI, Hyderabad

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 7

CAPITAL PROJECTS

CAPITAL PROJECTS

As the Power sector of the country is expanding, additional power capacity is being added and an addition of 78,000 MW Capacity was planned in the Twelfth Five-Year Plan. This demand for additional power calls for installation of additional equipment for generation, transmission and distribution of power. Additional equipment, in turn, bring in need for augmenting testing facilities. During the XI Five-Year Plan itself, the MoP, GOI approved several projects to enhance there search 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 JV Company-NHPTL, in which PGCIL, NTPC, NHPC, DVC and CPRI are J.V. Partners.

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

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

XII Plan Proposals

CPRI has been earmarked with Rs. 1368.90 Crores by MoP, Govt. of India as Govt. Budgetary Support during 12th Plan period (2012-2017).

A project titled "Augmentation& New Facilities Projects", at a total cost of Rs. 105.90 Crore is approved and is under implementation from March 2014. This project is likely to be completed by March 2018.

Another project titled "Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment" under the 12th Plan, at a total cost of Rs.640.00 Crores, is approved on 5th January 2015 & is under implementation from April 2015.

The other project titled "Establishment of New Test Facilities" under the 12th Plan, at a total cost of Rs.356.10 Crores, was approved on 5th January 2015 and is under implementation from April 2015.

"Research & Development Schemes of CPRI" under 12th Plan at an estimated cost of Rs.80.00 Crore was approved on 11th June 2014, comprising of In-house Research Schemes of CPRI (Rs.15.00 Crores), Research Scheme on Power (Rs. 20.00 Crores) and R&D under National Perspective Plan (Rs.45.00 Crores) are under implementation.

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

Details of XII Plan Projects:

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 to500kVA) and (b) Solar PV modules (up to 500Wp)	28.00
	(vi) Augmentation, Modernisation 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 sting of Transformers, Excitation System for existing Generator	13.00
II.	**"Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators and associated equipment" under XII Plan, at an estimated cost of Rs. 640.00 Crores, comprises of following project components:**	
	I. Augmentation of High Power Short Circuit Test facilities by installation of two Additional 2500 MVA Generators with associated equipment at High Power Laboratory, CPRI, Bangalore.	509.00
	II. Upgradation of Short Circuit test facilities	
	A. Establishment of '350 MVA Online Short Circuit Test Station' at UHV Research Laboratory, CPRI Hyderabad	120.00
	B. Establishment of Short Circuit Testing of Transformers, Excitation System for existing Generator	11.00
III.	**'Establishment of New Test Facilities' under XII Plan Proposals' at an estimated cost of Rs. 356.10 Crores**	
	A. Establishment of New Transmission Tower and Seismic Test Facility	
	1. Establishment of transmission line tower test station and associated facilities	90.00
	2. Augmentation of test facilities at STDS, Bhopal	20.00
	3. Augmentation of Pre-Qualification test facilities at CPRI, Bangalore	11.50
	4. Establishment and Augmentation of Short Circuit test facilities at CPRI, Bangalore.	8.50
	5. Relocation and Augmentation of Thermal Research Centre (TRC), Nagpur and Expansion of the Nagpur Unit	48.00
	6. Enhancing Test Facilities of Regional Oil Testing Laboratories including Relocation of RTL, Kolkata	22.10
	7. Establishment of 40 KA continuous current Temperature Rise test Facility at HPL, CPRI, Bangalore	15.00
	8. Setting up of Test Facility for LV, MV & Power Cables at Western Region (Outlay: Rs. 115.30 Crores)	100.00
	8a Establishment of Total Test Facility for Transformers at CPRI Western Zone	5.30
	8b Setting up of Oil Testing Laboratory in the Western Zone	10.00
	8c Establishment of Test facilities for Energy Meter	
	9. Centre of Excellence for Non-Destructive Testing & Evaluation of Power Plant Components	8.00
	10. Establishment of Phasor Measurement Unit (PMU) System Testing Calibration Lab	6.65
	11. Smart Grid Research Laboratory	11.05

Sl. No.	Title of the Proposal	Cost (` in Crores)
IV	**Research & Development schemes of CPRI under XII Five-Year Plan**	
	A. Plan R & D (Research & Consultancy)	15.00
	B. Research Scheme on Power	20.00
	C. National Perspective Plan R & D Scheme (Including UAY, IMPRINT Schemes	45.00
	Total	**1182.00**

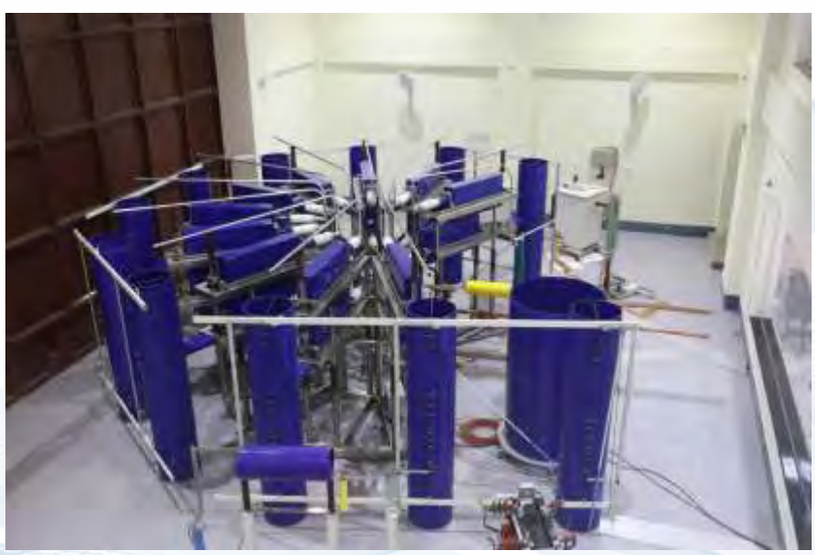
Physical Progress of Ongoing Spill over XII Plan Capital Projects

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

Project components:

(i) Upgradation of High Voltage/Ultra High Voltage Test Facilities

The Impulse Current Laboratory was inaugurated on18th February 2017 by Shri P.K. Pujari, IAS, Secretary (Power), Ministry of Power, Govt. of India. The project was completed in March 2017.



(ii) Upgradation of Real Time Digital Simulator

EATP Software procured. Tender for RTDS procurement has been opened and order placed. The project was completed in March 2017.

OPAL RT SIMULATOR

TRAINING PROGRAMME OF OPAL RT SIMULATOR (13th - 25th March 2017)

(iii) Augmentation of Energy Meter & Calibration Laboratory

Out of 75 items identified Purchase Order have been placed for 55 items. The procurement is in advanced stage for the balance items. Civil work shall be executed by CPWD which is in progress and expected to be completed by March 2018.

(iv) Augmentation of Protocol & Meter Testing Laboratory

Equipment procurement process has been initiated. Civil work shall be executed by CPWD which is in progress and expected to be completed by March 2018.

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

All the major items to be procured are in advanced procurement stage. Rs.16 Cr. worth equipment, Purchase Orders have been released including Rs.12 Cr. worth Grid Tied Inverter test facility. The major item Grid tied inverter test facility has been commissioned. The Civil work has been handed over to CPWD which is in progress and scheduled to be completed by March 2018.

(vi) **Augmentation, Modernisation & Capacity addition of Battery, Ingress Protection and Illumination test facilities**

Rs.4.5 Cr. worth equipment order has been placed. Rs. 3 Cr equipment under advanced procurement stage. Civil work has been handed over to CPWD, the work is in progress and the same is scheduled to be completed by March 2018.

(vii) **Augmentation & Modernisation of Diagnostics, Cables, Capacitors, Temperature Rise, Environmental Test Facilities**

All the items identified under this project are in advanced procurement stage. No civil works involved in this project. The project was completed in March 2017.

STATUS ON COMPLETION

132 kV Cable test in progress

A view of loading coils

Control panel for current loading system

Ageing oven

Six cell ageing oven

Cyclic corrosion test equipment

Computer controlled Electromechanical Universal Testing Machine

Accelerated Weathering Tester (Fluorescent UV lamps)

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

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

M/s. CESI, Italy has been identified as the Global Consultant. First report from M/s. CESI, Italy is expected by July 2017.

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

M/s. CESI, Italy has been identified as the Global Consultant.First report from M/s. CESI, Italy is expected by July 2017.

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

Out of 10 items identified, with regard to 8 items, purchase orders have been placed.

III. Establishment of New Test Facilities project

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

   All the items identified to be procured in this project, the specifications have been finalized. Civil works shall be carried out by CPWD. MoU with CPWD has been signed for UHVRL tower testing station. LC has been established for Major equipment i.e. Hydraulic Shaker System worth Rs.10 Cr.

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

   All the items to be procured worth Rs. 18 Cr.are in advanced procurement stages. For some of the items, orders have been placed. Civil work, the work order has been placed by CPWD, work is in progress.

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

   Accessories for Impulse Generator worth Rs 4.13 Cr., the LC has been established.

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

   All the items to be procured worth Rs.8 Cr. are in advanced stages of procurement, Rs.4 Cr. worth Short Circuit Transformer, the order has been placed.

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

   Land possession formalities are completed. Construction of compound wall is in progress. With respect to construction of Laboratories and Guest House, CPWD is carrying out the preliminary estimate.

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

   All the major equipment to be procured are in advanced procurement stage. A few equipments have been delivered.

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

   Specification for all the equipment under finalization. Global Consultant has been finalized. First report is expected in July 2017.

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

(b) Setting up of test facilities for oil testing lab at Nashik

All the major equipment to be procured are in advanced procurement stage. A few equipments have been delivered.

(c) Establishment of test facilities for Energy Meter

Nashik has been identified as the new location. Land at Nashik has been allocated to CPRI by Govt. of Maharashtra. Possession of land is taken and Civil work (Compound Wall) is in progress.

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

   All the equipment to be procured are in advanced stages of procurement. Out of 10 items identified, Purchase orders for 9 items have been placed. No civil work involved in this project.

10. **Establishment of Phasor Measurement Unit (PMU) system Testing and calibration Laboratory**

All items to be procured including softwares are in advanced procurement stage. Purchase order for PMU system worth Rs. 2.6 Cr, the order has been placed. Civil work has commenced and scheduled to be completed by February 2018.

11. **Smart Grid Research Laboratory**

MoU with USTDA consultant has been signed. Procurement of equipment is in progress. Civil work has commenced and scheduled to be completed by February 2018.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 8

ADMINISTRATIVE MATTERS

ADMINISTRATIVE MATTERS

Governance

The following distinguished persons have joined the Governing Council and the Society of CPRI as members in 2016-17:

1) Shri Ravindra Kumar Verma, Chairperson, Central Electricity Authority as Vice President of CPRI Governing Council vice Shri Major Singh
2) Shri K K Arya, Member (Power Systems), CEA a Member of CPRI Governing Council vice Shri S D Dubey
3) Shri Pankaj Batra, Member (Planning), Central Electricity Authority a Member of CPRI Governing Council
4) Shri S K Singh, Advisor, Ministry of New and Renewable Energy (MNRE) a Member of CPRI Governing Council vice Dr. Praveen Saxena
5) Shri Sanjay Sardana, President-IEEMA a Member of CPRI Governing Council vice Shri Babu Babel
6) Shri Abhay Bakre, Director General, Bureau of Energy Efficiency a Member of CPRI Governing Council vice Dr. Ajay Mathur
7) Shri V S Nandakumar, Director General, Central Power Research Institute as Member-Secretary of CPRI Governing Council vice Shri Sudhakar R Bhat

The following distinguished persons have joined the Standing Committee of CPRI as Members in 2016-17:

1) Shri K K Arya, Member (Power Systems), Central Electricity Authority became a Member of CPRI Standing Committee vice Shri S D Dubey

2) Shri V S Nandakumar, Director General, Central Power Research Institute as Member-Convener vice Shri Sudhakar R Bhat

During the course of the year, the 80th Governing Council Meeting of CPRI was held on14th September 2016 & 81st Governing Council Meeting of CPRI was held on 25th November 2016 at Ministry of Power, New Delhi to consider various issues pertaining to the Institute, and the 77th, 78th & 79th meeting of CPRI - Standing Committee was held on15th July 2016, 21st October 2016 & 10th February 2017 at Ministry of Power, New Delhi & at CPRI, Bangalore.

The Parliamentary Standing Committee on Energy reviewed the CPRI activities at Bangalore, on 26th October 2016. Shri Raj Pal, Economic Adviser, Ministry of Power, Govt. of India and other senior officers from Ministry of Power, New Delhi were present during the review meeting with CPRI officers.

Important Events:

- The 3rd Meeting of Technical Committee on Grid, Distribution and Energy Conservation Research of CPRI, was held at CPRI, Bangalore, on 6th October 2016. The meeting was chaired by Dr. S V Kulkarni, Professor, IITB, Mumbai. Members from CEA, TANGEDCO participated in the meeting. Progress of ongoing and completed projects were presented and 6 new proposals were considered. Projects recommended by Technical Committee on Grid, Distribution & Energy Conservation Research were later placed before Standing Committee on R&D for approval.
- The 3rd Meeting of Technical Committee on Transmission Research of CPRI was held at CPRI, Bangalore, on 7th November 2016. The meeting was chaired by Dr. S C Srivastava, Professor, IIT, Kanpur. Members from CEA, BHEL, POWERGRID participated in the meeting. Progress of ongoing and completed projects were presented and 5 new proposals were considered. Projects recommended by Technical Committee on Transmission Research were later placed before Standing Committee on R&D for approval.
- The 3rd Meeting of Technical Committee on Thermal Research of CPRI was held at CPRI, Bangalore, on 17th November 2016. The meeting was chaired by Dr. R P Vedula, Professor, IITB, Mumbai. Members from CEA, BHEL, NETRA, TATA POWER participated in the meeting. Progress of ongoing and completed projects were presented and 2 new proposals were considered. Projects recommended by Technical Committee on Thermal Research were later placed before Standing Committee on R&D for approval.
- The 3rd Meeting of Technical Committee on Hydro Research of CPRI was held at CPRI, Bangalore, on 18th November 2016. The meeting was chaired by Shri P C Kureel, Chief Engineer, CEA, New Delhi. Members from CEA, BHEL, IITM participated in the meeting. Progress of ongoing and completed projects were presented and 2 new proposals were considered. Projects recommended by Technical Committee on Hydro Research were later placed before Standing Committee on R&D for approval.
- The 19th Meeting of Standing Committee on R&D (SCRD) was held at NRPC, New Delhi, on 22nd December 2016. The meeting was chaired by Shri. S D Dubey, Chairperson, CEA, New Delhi. Members from CEA, BHEL, POWERGRID, NETRA and NHPC participated in the meeting. IHRD / RSoP / NPP projects recommended by Technical Committees were approved during the SCRD meeting for funding support.
- The meeting on Grid, Distribution and Energy Conservation Research for projects under LED Scheme of CPRI, was held at CPRI, Bangalore, on 6th December 2016. The meeting was chaired by Dr. S V Kulkarni, Professor, IITB, Mumbai. Members from CEA, TANGEDCO, IEEMA, TIFR, IISc. & IITB participated in the meeting. Thirteen (13) new project proposals were presented. Projects recommended by the Technical Committee on Grid, Distribution & Energy Conservation Research were later placed before the Standing Committee on R&D for approval.

Signing of MoUs

- A Memorandum of Understanding (MoU) was signed between WBSEDCL and CPRI for conducting Induction Level Training Programme for Engineers of M/s. WBSEDCL at CPRI, Bangalore, on 16th November 2016. The MoU was signed by Director Dr. R Ramesh Babu on behalf of CPRI and Director HR Sri Sujay Sarkar on behalf of M/s. WBSEDCL. Sri V. S. Nandakumar, Director General - CPRI, Sri Sabyasachi De, GM-HR, WBSEDCL and Dr. M G Ananda Kumar, Engineering Officer, Training Division CPRI, Bangalore, were present during the occasion.

Signing of MoU between WBSEDCL and CPRI

- As per the guidelines of the Ministry of Power, Memorandum of Understanding is implemented for RSoP and NPP Projects. Memorandum of Understanding (MoU) for 26 RSoP Projects and 8 NPP Projects during 12th Plan after legal clearance and approval of Competent Authority was signed with the concurrence of the Project Implementing Organization. Action was taken by R&D Management, CPRI, Bangalore for release of 1st installment of funds and Accounts-I have released the 1st installment of funds to the Organizations. Project Investigators have started the work.

- CPRI signed contract with POWERGRID for turnkey project of testing for 8 Nos. of 220kV D/C Towers for strengthening scheme for North-Eastern States. Value of contract Rs.3.55 crore and execution of contract is in progress.

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

- The Institute Day was celebrated at CPRI, Bangalore, on 16th January 2017. Shri K.N. Vyas, Director, Bhabha Atomic Research Centre, Department of Atomic Energy, Govt. of India delivered Jawaharlal Nehru Birth Centenary Memorial Lecture on 'Relevance of Nuclear Energy for Societal Applications' on the occasion. Shri V.S. Nandakumar, Director General-CPRI presided over the function. Mylavarapu Subbalakshamma Award was awarded to Smt. A. Amruthakala, Additional Director, CPRI, Bangalore being the best Lady Scientific/Engineering Officer for the most significant work done by her during the year. Shri B.M. Naidu Award for best research paper of the year based on testing clues/data, was awarded for the Paper titled "Modelling and simulation analysis of static drive for large synchronous machine" published in the CIGRE Science & Engineering, Volume No. 4, February 2016 issue, to Dr. Arun Kumar Dutta, Joint Director, STDS-CPRI, Bhopal

From Left to Right: Shri V.S. Nandakumar, Director General-CPRI, Shri K.N. Vyas, Director, Bhabha Atomic Research Centre, and Dr. R. Ramesh Babu, Director-CPRI on the dias

Smt. A. Amruthakala, Additional Director, CPRI, Bangalore receiving the Mylavarapu Subbalakshamma Award being the best Lady Scientific/Engineering Officer of the year

Dr. Arun Kumar Dutta, Joint Director, STDS-CPRI, Bhopal receiving Shri B.M. Naidu Award for best research paper of the year based on testing clues/data

- STDS, CPRI, Bhopal celebrated the Institute Day on 16th January 2017. The Chief Guest of the inaugural function was Shri Sanjeev Gupta, General Manager, BHEL and Guest of Honour was Dr. Vinay Mishra from BSS College. There was a get together of all employees in the evening with musical program and dance performance by children of employees. The photograph is given below:

- Institute Day was celebrated in UHVRL, CPRI, Hyderabad, on 16th January 2017. Shri. T. Jagath Reddy, Director (Transmission), TSTRANSCO, Hyderabad was the Honorable Chief Guest and he delivered technical lecture on "Challenges in HV transmission lines and Power Scenario". Cultural programs were arranged in the evening. The photograph is given below:

Other events are as follows:

- The Government of India has recognized the need to modernize the Central Government offices through the introduction of Information and Communications Technology. e-Office is aimed at increasing the efficiency by the way of usage of structured work flow and rule based file routing, quick search and retrieval of files and office orders, digital signatures for authentication, forms and reporting components. CPRI has implemented e-Office premium software developed by NIC, New Delhi for digitizing leave management, tour management, file management, knowledge management, personnel information system etc.

Activities Related to Women Employees

CPRI 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. No sexual harassment case was reported during the year 2016-17.

International Women's Day Celebration

International Women's Day-2017 was celebrated at CPRI, Bangalore, on 13th March 2017, with the Theme- "Be bold for a Change, Better status of women". The Chief Guest of the function was Smt. Anandi Ramalingam, Director, BEL, Bangalore. Smt. Mahadevi Koppad wife of late Lance Naik Hanumanthappa Koppad, the Siachen brave heart was felicitated on the occasion.

STDS-CPRI, Bhopal celebrated International Women's day on 8th March, 2017. During the function Dr. Preeti Mishra, Professor, Excellence College, Dr. Sarita Nema, HOD Electrical Department from MANIT, Bhopal and Mrs. Dipti Mishra , General Manager from MPMKVV, Bhopal were the guests of honour. They delivered lectures on the rights of women in the society and this year's theme of "Be bold for a change, Better status of women".

Statement indicating total number of employees in the Institute and number of women employees in each category as on 31st March 2017

Sl.No.	Post(s)	No. of employees	No. of women employees	Percentage of women employees
1	Director General	1	-	-
2	Director	1	-	-
3	Additional Director	25	5	20.00
4	Joint Director	49	4	8.16
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer	1	-	-
7	Scientists/Engg Officers	123	19	15.45
8	Scientists/Engg Assistants	22	2	9.09
9	Non-Tech Officers	15	3	20.00
10	Office Staff/Stenographer	91	37	40.66
11	Library staff	3	2	66.67
12	Technicians	69	-	-
13	Technical Attendant/Attendant	76	4	5.26
14	Drivers/Cook-cum-care taker	10	-	-
15	Multi-Tasking Staff	35	4	11.43
	Total	**522**	**80**	**15.33**

Staff strength of the Institute as on 31st March 2017

Sl.No.	Posts	Number of employees
1	Director General	1
2	Director	1
3	Additional Director	25
4	Joint Director	49
5	Chief Administrative Officer (SG)	1
6	Chief Accounts Officer	1
7	Scientific/Engg. Category	145
8	Technicians	69
9	Administrative & Supporting Staff	154
10	Supporting Technical Staff	76
	TOTAL	**522**

Vigilance Activities

Smt. Abha Anand Kishore, IRS, CVO of Rural Electrification Corporation Ltd. was entrusted with additional charge to look after the work of CVO, CPRI as per Ministry of Power letter No. C-30019/4/2013-V&S dated 24th June 2015. Subsequently, Shri Birendra Kumar, IA&AS was appointed as Chief Vigilance Officer of Power Finance Corporation and in view of assigning additional charge of CPRI to CVOs of PFC by Ministry of Power, Shri Birendra Kumar, IA&AS has taken over the charge of CVO, CPRI since July 2016.

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

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

Vigilance Awareness Week was observed in CPRI from 31st October to 5th November 2016. "Integrity Pledge" was administered to all the employees of Head Office and Units at 11 A.M on 31st October, 2016. Banners on Vigilance Awareness Week were displayed at prominent locations at Head Office and the Units of CPRI. Background of the theme of Vigilance Awareness Week -2016 was displayed on the web page of CPRI and




hyperlink for Integrity Pledge was provided in CPRI website. All the employees of CPRI took e-pledge using the hyperlink provided in the website as per the directives of CVC. Pamphlets on "Vigilance Awareness Week-2016" and resolution of the Govt. of India on PIDPI guidelines relating to whistle blower mechanism were distributed among the employees and also e-mailed to all. Pamphlets were also displayed on Notice Boards in all Units, Divisions and Sections.

A number of competitions were conducted to deliberate the importance of vigilance awareness and was well participated by the staff of the Institute. Competitions such as Essay on the theme of "Information Technology as a tool to eliminate corruption" and Speech on the theme of "Elimination of corruption – promotion of the business/public participation in promoting Integrity and eradicating corruption" were organized to inculcate greater awareness on anti-corruption measures.

Observance of the "Vigilance Awareness Week" concluded on 4th November, 2016 (4th being the last working day of the week) with a function in Head Office by inviting Shri Prakash Gowda, Supdt. of Police, Chief Vigilance Officer (BESCOM), as Chief Guest. A compliance report on observance of "Vigilance Awareness Week" at CPRI was also submitted to Central Vigilance Commission (CVC), New Delhi.

Online complaints can be lodged to email id: cpricvo.cpri@nic.in

Rotational Transfer Policy of CPRI is implemented and a circular to this effect is uploaded on the website. CPRI Policy on Vigilance relating to Agreed list and Officials of Doubtful integrity has been formulated.

Liaison Officer for SC / ST & PWD Welfare Activities

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

Smt J. Sreedevi, Joint Director and Shri D. Revanna , Joint Director, CPRI, Bangalore served as Liaison Officers for SC/ST & PWD and OBC respectively during the year 2016-17.

The Director General, Additional Directors along with liaison officers addressed the grievances of the SC/ST and PWD employees on 14th April 2016.

125th Birth Anniversary of Bharat Ratna Dr. B R Ambedkar was celebrated at CPRI, Bangalore, on 29th June 2016 in magnificent way. Chief Guest and Guest of Honor of this function were Shri Mano Rakkhita Banteji from Budha Peeta Kollegala and Dr. S. R. Kesava from Bangalore University respectively. Shri M. Siddhartha Bhatt, Additional Director, CPRI, Bangalore, presided over the function. On this august occasion, Management of CPRI distributed the meritorious awards to the children of CPRI employees who topped in 10th and 12th standard. As part of the 125th celebrations, Blood donation camp & Quiz were conducted and T-Shirt with Dr B. R. Ambedkar logo & sweets were distributed to employees. Memorable cultural program was also organized by Janapada Gana Gandharva Sri. Appagere Thimmaraju and his troop from Department of Kannada & Culture Bengaluru, Karnataka.

Representation of Scheduled Caste and Scheduled Tribe as on 31st March 2017

Group	Total	SC	ST	OBC	Others
A	213	47	14	35	117
B	140	28	27	17	68
C	134	40	17	22	55
MTS	35	15	3	0	17
Total	522	130	61	74	257
Percentage	-	24.90	11.69	14.18	49.23

Representation of Physically Challenged Employees as on 31st March 2017

Sl.No.	Post(s)	No. of employees	No. of physically challenged employees	Percentage of physically challenged employees
1	Director General	1	-	-
2	Director	1	-	-
3	Additional Director	25	-	-
4	Joint Director	49	-	-
5	Chief Administrative Officer (SG)	1	-	-
6	Chief Accounts Officer	1	-	-
7	Scientists/Engg. Officers	123	6	4.88
8	Scientists/Engg. Assistants	22	1	4.55
9	Non-Technical Officers	15	-	-
10	Office Staff/Stenographer	91	3	3.30
11	Library staff	3	-	-
12	Technicians	69	-	-
13	Technical Attendant/Attendant	76	5	6.58
14	Drivers/Cook-cum-care taker	10	-	-
15	Multi-Tasking Staff	35	-	-
	Total	**522**	**15**	**2.87**

Public & Staff Grievance Cell

Central Power Research Institute has a separate Cell for redressing the Staff and Public Grievances. The Grievance Redressal Mechanism is part and parcel of the machinery of CPRI administration. The role of Public and Staff Grievance Cell is primarily to assist the management in redressing the Staff and Public Grievance petitions. The Grievance received by the department are forwarded to the concerned section who are dealing with substantive function linked with the grievance for redressal under intimation to the complainant. The complaints are either received in person, by post, Fax, e-media or through online CPGRAMS portal. CPRI web portal has direct link to CPGRAMS portal www.CPGRAMS.IN. The CPGRAMS offers to the staff and public the facility of lodging online grievances, on-line reminders and online view of current status of the grievances. The guidelines indeed is that the CPRI deal with every grievance in a fair, objective and just manner. The monitoring of grievances received and disposed of by CPRI under Public & Staff Grievances Officer is on a regular basis.

During the year 2016-17, CPRI has redressed several grievance petitions including 13 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.

CPRI Library and Information Centre, Bangalore

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

Number of Publications acquired during the year 2016-17:

The total number of members is 178 and during the year 11 new members were added. Total stock is 34,394 and 199 publications were added during the year. Total number of journals subscribed during the year is 85. Out of 85, foreign journals are 30, Indian journals are 33 (all are technical reference publications), Hindi journals are 3, Journals on membership are 5, online journal is 1, 7 newspaper and 6 general reading magazine.

Library and Information Centre has been downloading IEC Standards since 2003. During the year, 53 standards were downloaded and uploaded in the CD/DVD server. Indian standards, ASTM complete set 2016 and Electra 1967-2000 are available on Intranet.

Classification scheme and arrangement:

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

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

New Services :

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

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 9

FINANCE & ACCOUNTS

FINANCE & ACCOUNTS

The Institute has done well in its financial performance during the year 2016-17 and earned revenue of Rs.18384.95 lakhs

Revenue earnings during the past five years

(Amount in Rs. Crores)

Year	Revenue	Percentage increase (Base year 2012-2013)
2016-2017	183.85	24.30
2015-2016	159.20	7.63
2014-2015	167.27	13.09
2013-2014	159.97	8.15
2012-2013	147.91	-

Increased services rendered to the Utilities and Industries are well reflected in the financial performance raising the revenue earnings from Rs. 14790.65 lakhs in 2012-2013 to Rs. 18384.95 lakhs during the current year. During the year under report, as against the revenue realization of Rs. 18384.95 lakhs, the expenditure on non-plan activities stood at Rs.17007.25 lakhs resulting in a surplus of Rs.1377.69 lakhs. For the 29th year in succession, the Institute has not drawn any Non-Plan Grant-in-Aid from the Government of India.

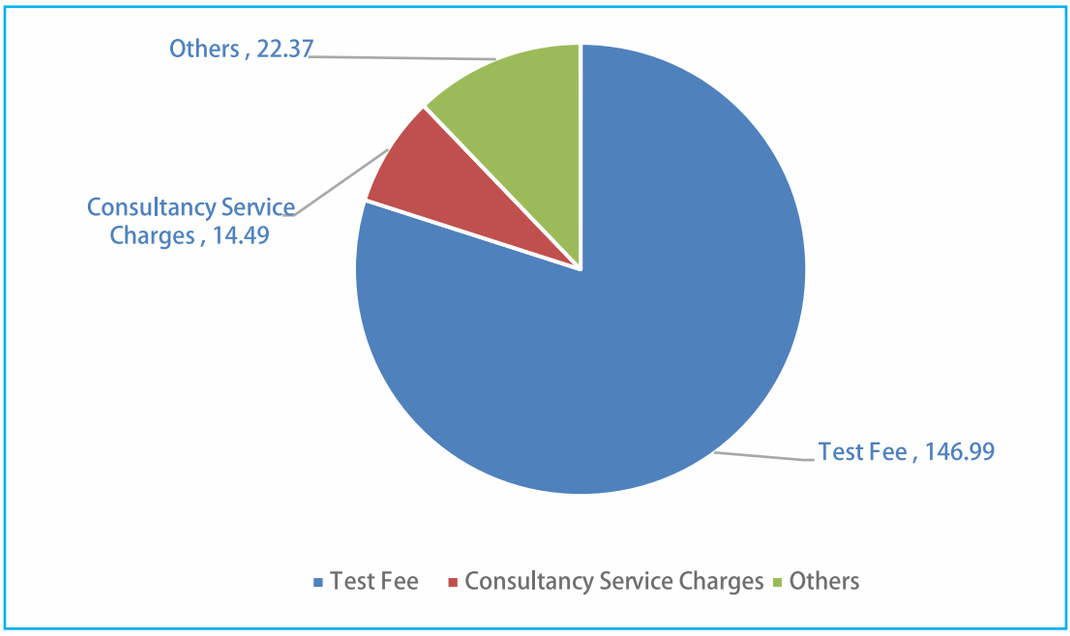
During the year, the expenditure under various heads has been as follows:

Non Plan Expenditure	Rs.17007.25 lakhs
Plan R & D Expenditure	Rs. 183.17 lakhs
Plan Capital Expenditure	Rs. 7516.93 lakhs
RSoP Schemes	Rs. 564.49 lakhs
NPP Schemes	Rs.1232.58 lakhs

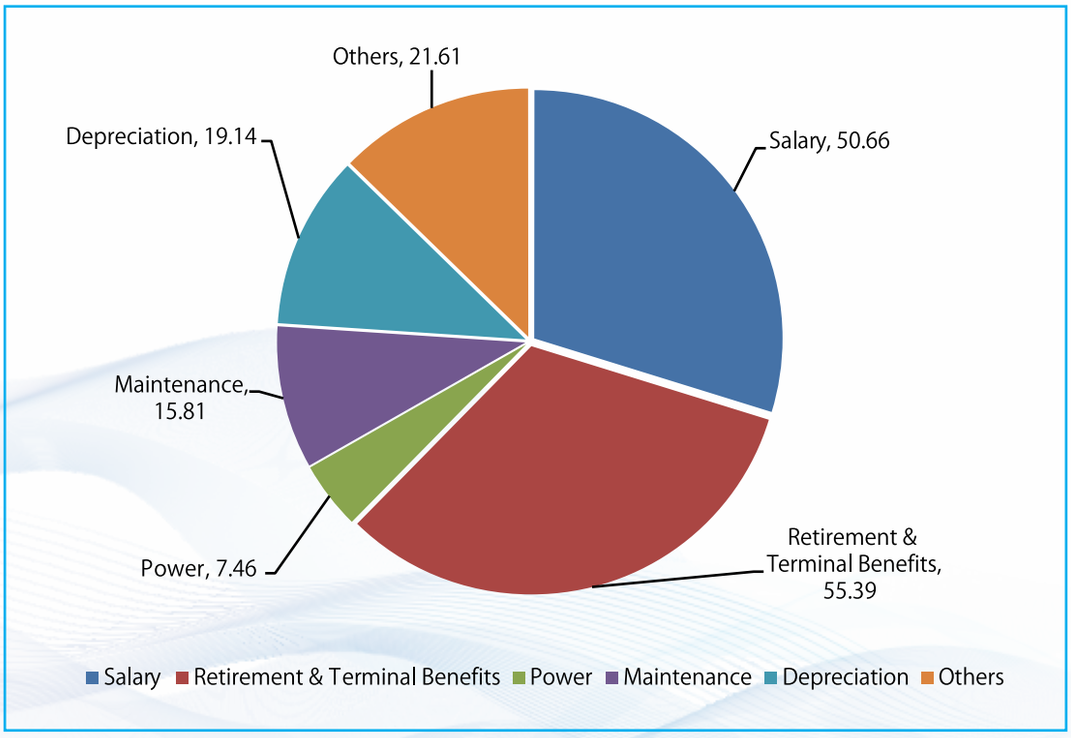
The Institute received grants-in-aid (Plan) of Rs.6579.00 lakhs from the Government of India during the year. The details along with Auditors Report are furnished in Appendix–11.

As at the end of March 2017, the capital investment by the Government of India on the Institute has been Rs.81554.99 lakhs.

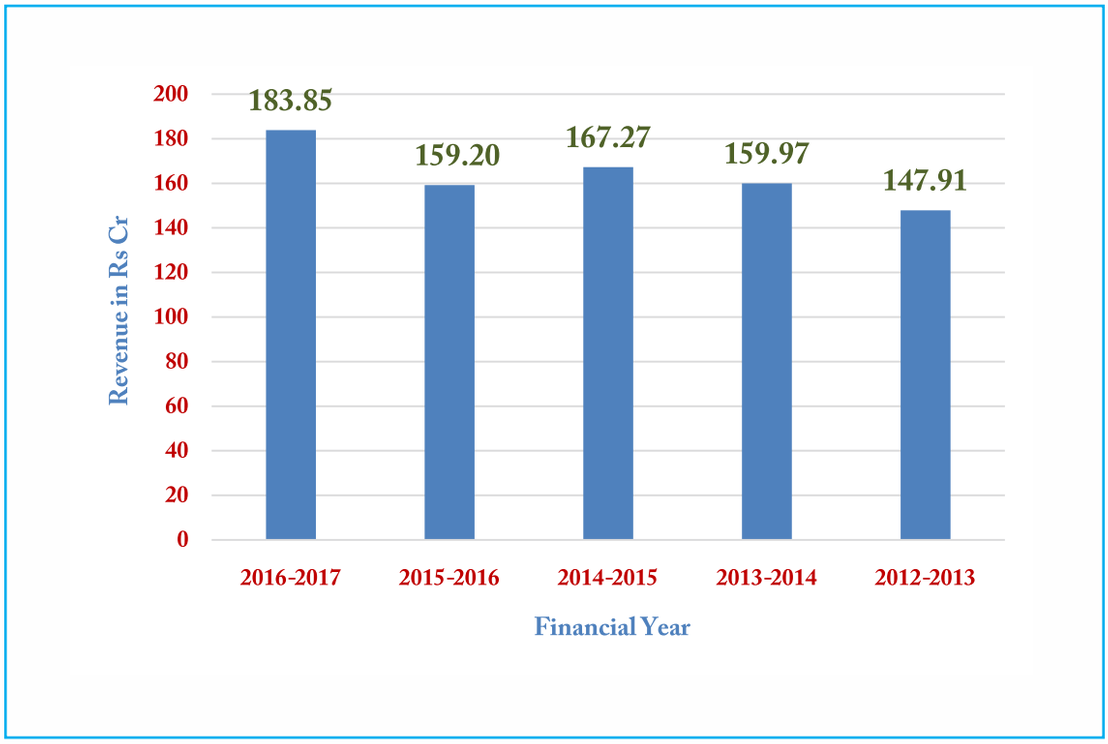
REVENUE DURING 2016-17 UNDER MAJOR HEADS (₹ in Crores)



EXPENDITURE DURING 2016-17 UNDER MAJOR HEADS (₹ in Crores)



REVENUE EARNINGS DURING THE PAST FIVE YEARS (₹ in Crores)



CENTRAL POWER RESEARCH INSTITUTE

SECTION - 10

हिन्दी

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 2016 - 17 are listed below:

1. Awards

Rajbhasha Keerthi Puraskar

Central Power Research Institute, Bangalore was awarded the prestigious Rajbhasha Keerthi Puraskar- Second for the successful efforts in the Progressive use and Implementation of Hindi for the offices in Region 'C' during the year 2015-16 . The award was presented by Honourable President of India, Shri Pranab Mukherjee, during Hindi Divas function organized at Rashtrapathi Bhavan, New Delhi on 14th September 2016 which was received by Shri Sudhakar R Bhat, Director General of the Institute. The Institute received the award for the 7th time consecutively, which is also the 11th award won by CPRI so far.

2. Seminars and Workshops

a) **Workshop on Service Book entries**

A Workshop on Service Book entries was held for the Ministerial Staff of the Institute at Swayambhu Hall, CPRI, Bangalore, on 6th April 2016. Twenty two officials were trained in this workshop. Smt. K. Anuradha , Assistant Director (O.L.), ADE (DRDO) was invited as the Guest Lecturer. The Workshop had interactive sessions and all the employees participated enthusiastically in this programme.

b) **Workshop on Official Language Policy and Official Language Implementation**

A Workshop was conducted on 11th April 2016 on Official Language Implementation for the Ministerial Staff. Dr. R. C. Sharma, Joint Director (O.L.), Ministry of Power highlighted the importance of Official Language Policy and drew attention of the target prescribed in the Annual Programme issued by the Department of Official Language. Twenty employees were trained in this programme.

c) Official Language Orientation Programme

One day Official Language Orientation Programme was organized on 23rd June 2016 at the S.J. Auditorium, CPRI, Bangalore for the Rajbhasha Adhikaris of all Central Govt. Offices located at Bangalore. The following topics were discussed in the O.L. Orientation Programme:

1. Role of the Rajbhasha Adhikaris in overcoming problems encountered in compliance of O.L. policy.
2. O.L. related work and action plans.
3. Caution while filling the O.L. progress report / Inspection Questionnaire.
4. Role of the Rajbhasha Adhikari during the Inspections conducted by the Parliamentary Committee on O.L.

The faculty members were drawn from various Organizations. They are:

1. Shri Shankar Prasad, Deputy General Manager –O.L. (Retired), HAL, Bangalore.
2. Dr. P S R Murthy, Member Secretary, TOLIC, Bangalore and Senior Hindi Officer, CSIR- NAL, Bangalore.
3. Smt. Sulekha Mohan, Deputy General Manager – O.L. (Retired), Canara Bank, Bangalore
4. Shri Srinivas Rao, Hindi Officer, BEL, Bangalore.

Around 80 Rajbhasha Adhikaris of various Central Govt. Organizations participated in this Workshop.

3. Hindi Month and Hindi Divas

(a) Hindi Month

Hindi Month is observed every year in the Institute. Hindi Month was conducted from 29th August 2016 to 9th September 2016 with ten Competitions held separately for the proficiency group and working knowledge group of employees. The competitions held were : Vocabulary, Quiz, Antakshari, Hindi Poetry Recitation, Conversation, Speech, Essay writing, Cross word and Dictation

(b) Hindi Divas Celebration

Hindi Divas was celebrated on 28th September 2016 at Silver Jubilee Auditorium, CPRI, Bangalore. Smt. Janaki Nair, Joint Director, Central Translation Bureau, Bangalore was invited as the Chief Guest. On this occasion, prizes were awarded to the winners of Technical Article Competition for the year 2015-16 organised by the Institute. The award winning articles were from the following Organizations :

First Prize : Microwave Tube Research and Development Centre, Bangalore
Second Prize : National Aeronautical Laboratories, Bangalore
Third Prize : Aeronautical Development Establishment, Bangalore
Consolation Prize : CPRI, Bangalore

Prizes for various competitions and various incentive schemes held during Hindi Month were awarded in this function. This was followed by a cultural Programme presented by the In-house talent of CPRI. The cultural show was well appreciated by one and all.




4. On the spot study visit by Parliamentary Standing Committee on Energy

On the spot study visit by Parliamentary Standing Committee on Energy was conducted on 26th October 2016. All documents viz., Brief summary, Questionnaire, all annexures, Display slides were made available in Hindi version.

5. Publications

a. Annual Report:

The Annual Report of the Institute is published in bilingual every year. Annual Report for the year 2015-16 was published in English and Hindi separately.

b. CPRI News:

The quarterly magazine of the Institute "CPRI News" is brought out in bilingual.

c. STDS Darpan

The 18th edition of the In-house magazine "STDS Darpan" of the Institute's Bhopal unit was published.

6. Awards under Incentive Scheme

a. Noting and Drafting in Hindi

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

b. Annual Technical Article Competition

Technical Article Competition for the year 2015-16 -

To promote Hindi writing in Technical field, the Institute is organizing an Annual Technical Article Competition for the past 20 years for the Scientists of all Central Govt. Organizations. The best three articles were awarded prizes on Hindi Divas, on 28th September 2016 in the Institute at Bangalore.

7. Facilities Provided

a. Learn 'A Word A Day' Scheme:

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

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 printing on folders

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

d. Supply of Forms

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

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

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

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

e. Brochures of Seminar in Bilingual

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

f. All Invitation Cards in Bilingual

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

g. Web Site

The web site of the Institute is available in Bilingual.

h. Tenders in Bilingual

All tenders issued by all Departments of the Institute are in Bilingual.

I. Advertisements in Bilingual

All advertisements related to recruitment and procurement issued by Administration Section & Purchase Section respectively are in Bilingual.

j. Question papers in bilingual for recruitment exams

Question papers were made available in bilingual for recruitment to various posts.

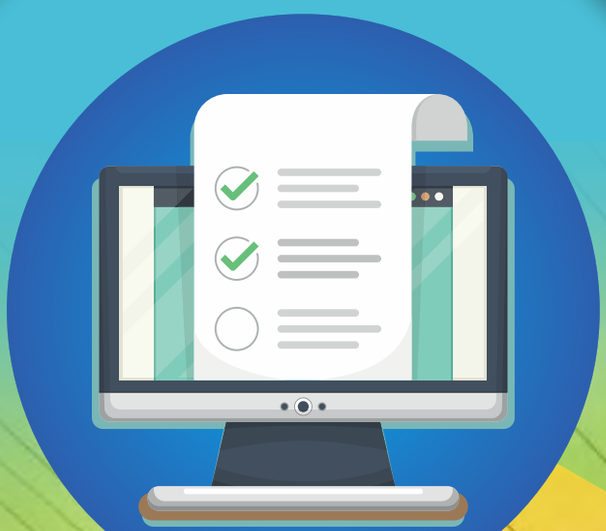
8. Activities of TOLIC

Inter Organizational Competitions were held by the Institute under TOLIC

The Institute has successfully conducted an Inter Organizational Competition– "Vocabulary", on 11th November 2016 for the employees of Central Govt. Offices of Bangalore, under the auspices of TOLIC for Joint Hindi Divas which had the enthusiastic participation of a majority of employees. Cash prizes to the winning Organizations were given during Joint Hindi Divas celebrations.

CENTRAL POWER RESEARCH INSTITUTE

SECTION - 11



APPENDICES 1 TO 11

APPENDIX - 1

THE MEMBERS OF STANDING COMMITTEE AS ON 31ST MARCH 2017

Sl.No.	Member Designated	Present incumbent/Nominee	Status
1	Additional Secretary/ Special Secretary – Ministry of Power	Shri B.P. Pandey, IAS Special Secretary Ministry of Power Shram Shakti Bhawan Rafi Marg New Delhi-110 001	Chairman
2	Member (Power System)- Central Electricity Authority	Shri K.K Arya Member (Power Systems) Central Electricity Authority Sewa Bhawan R.K.Puram New Delhi – 110 066	Member
3	Joint Secretary & Financial Adviser, Ministry of Power	Dr. Pradeep Kumar, I.A.S. Joint Secretary & F.A. Ministry of Power Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Member
4	Economic Adviser/ Joint Secretary (T&R) Ministry of Power	Shri Raj Pal Economic Adviser Ministry of Power Shram Shakti Bhawan Rafi Marg New Delhi – 110 001	Member
5	Director General - CPRI	Shri V.S. Nandakumar Director General Central Power Research Institute Post Box No. 8066 Bangalore–560 080	Member-Convener

APPENDIX - 2

THE MEMBERS OF COMMITTEE ON TESTING & CERTIFICATION AS ON 31ST MARCH 2017

CHAIRPERSON

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

MEMBERS

Prof. G.R. Nagabhushana MEMBER Prof. Emiretus(Retired), Dept. of High Voltage Engg. Indian Institute of Science,IISC (Post) Bangalore -560 012	**Shri D. K. Aggarwal** MEMBER Scientist F and Head, Bureau of Indian Standards Peenya Industrial Area, 1st Stage Tumkur Road Bangalore - 560 058
Shri A.K. Gupta MEMBER Executive Director (Engineering) NTPC Ltd., Engineering Office Complex, Sector-24, Noida - 201 301 (UP)	**General Manager, QA** MEMBER Vijay Electricals Ltd., Somajiguda, Hyderabad – 500 082
General Manager MEMBER Electroporcelains Division Bharat Heavy Electricals Ltd., Prof. C.N.R. Rao Circle, Opp. IISC, Malleshwaram Bangalore - 560 012	**Member (Commercial)** MEMBER West Bengal State Electricity Distribution Company Ltd., Vidyut Bhavan, Block – DJ Sector – II Bidhannagar, Kolkata - 700 091
Shri P. Bhaskar MEMBER Technical Director Karnataka Power Corporation Ltd. # 82, Shakthi Bhavan, R.C. Road, Bangalore - 560 001	**Shri P. Narasimha Murthy** MEMBER Retd. Chairman Karnataka Power Transmission Corpn. Ltd., No. 817, 6th Cross, MCR Layout, 5th Main, Vijayanagar, Bangalore – 560 040
Head (Product Development) MEMBER Siemens Ltd., M.V. Switchgear & Switch Boards P.B. No. 85, Thane Belapur Road Thane - 400 601	**Executive Director** MEMBER W. S. Test Systems Pvt. Ltd. 27th KM, Bellary Road, Doddajala Post Bangalore - 562 157

Shri Sunil Misra MEMBER Director General Indian Electrical & Electronics Manufacturers Association # 501, Kakad Chambers #132, Dr. A. Besant Road Mumbai - 400 018	**Business Technology Leader** MEMBER GE PCTDC, II Floor, III Phase John F. Welch Technology Centre Pvt. Ltd. # 52, Export Promotion Industrial Park, Phase II, Hoodi Village Whitefield Bangalore - 560 066
Shri N. Ravi Kumar MEMBER Executive Director Southern Region Transmission System – II Power Grid Corporation of India Ltd. Sahakara Bhavana # 32, Race Course Road Bangalore - 560 001	**Shri V. S. Nandakumar** Member Convener Director General Central Power Research Institute Prof. C.V. Raman Road P.B. No. 8066 Sadashivanagar P.O. Bangalore - 560 080

APPENDIX - 3

THE MEMBERS OF STANDING COMMITTEE ON RESEARCH & DEVELOPMENT (SCRD) AS ON 31ST MARCH 2017

Sl. No.	SCRD - Main Committee	Name	Position
1	Chairperson Central Electricity Authority New Delhi	Shri Ravinder Kumar Verma, Chairperson, CEA	Chairman
2	Joint Secretary & F.A., Ministry of Power, Govt. of India	Dr. Pradeep Kumar, Joint Secretary and F.A.	Member
3	Economic Adviser & Joint Secretary (I/C) of R&D, Ministry of Power, Govt. of India	Shri Raj Pal Economic Adviser & Joint Secretary (I/C) of R&D	Member
4	Member Planning (R&D) Central Electricity Authority	Shri Pankaj Batra Office of Member Planning 3rd Floor, Sewa Bhavan R K Puram, Sector -1, New Delhi – 110 066	Member
5	Chairman of the Technical Committee on Hydro Research	Prof. B.K. Gandhi Department of Mechanical & Industrial Engineering IIT, Roorkee – 247 667	Member
6	Chairman of the Technical Committee on Transmission Research	Prof. S. C. Srivastava, Department of Electrical Engineering Indian Institute of Technology Kanpur – 208 016	Member
7	Chairman of the Technical Committee on Thermal Research	Prof. R. P. Vedula, Department of Mechanical Engg. IIT-B, Powai, Mumbai - 400 076	Member
8	Chairman of the Technical Committee on Grid, Distribution & Energy	Prof. S. V. Kulkarni, 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

Sl. No.	SCRD - Main Committee	Name	Position
10	DIPP-IPR Expert	Ms. Palka Sahni Deputy Secretary Dept. of Industrial Policy & Promotion (DIPP) Ministry of Commerce & Industry Udyog Bhavan, New Delhi – 110011	Member
11	Director General CPRI	Shri V. S. Nanda Kumar Director General, CPRI	Convener
	Special Invitee		
12	CEA, New Delhi	Smt. Seema Saxena Chief Engineer (R&D) Central Electricity Authority 3rd Floor, Sewa Bhavan, R. K. Puram Sector -1, New Delhi – 110 066	Member
13	BHEL	Shri Subrata Biswas Director (E,R&D), BHEL, BHEL House Siri Fort, New Delhi - 110 049	Member
14	POWERGRID	Director (Projects) Power Grid Corporation of India Ltd. 'Saudamini', Plot No. 2, Sector 29, Gurgaon, Haryana – 122 001	Member
15	NTPC	Shri R. K. Srivastava Executive Director (NETRA) E3 ECOTECH-II, Udhyog Vihar, Gautam Budh Nagar – 201 306	Member
16	NHPC	Shri J. Choudhary GM (O&M) Division NHPC Office Complex Sector-33, Faridabad – 121 003	Member
17	MNRE	Ms. Varsha Joshi Joint Secretary Ministry of New and Renewable Energy Block 14, CGO Complex Lodhi Road, New Delhi - 110 003	Member

APPENDIX - 4

THE MEMBERS OF TECHNICAL COMMITTEE ON THERMAL RESEARCH AS ON 31ST MARCH 2017

Sl. No.	Affiliation	Position	Name
1	Professor from IIT-B, Mumbai	Chairman	Prof. R P Vedula, Dept of Mechanical Engg. IIT-B, Powai, Mumbai - 400 076
2	ED, NETRA, NTPC	Member	Shri Harjeet Singh AGM (NETRA) E3 ECOTECH-II, Udhyog Vihar, Gautam Budh Nagar – 201 306 (Uttar Pradesh)
3	ED- BHEL (Thermal)	Member	GM/PEM, BHEL House, Siri Fort, New Delhi -110 049
4	Chief Engineer (TE & TD) CEA	Member	Chief Engineer, (TE & TD) Central Electricity Authority Sewa Bhawan, 9th Floor South Wing, R K Puram, Sector-1 New Delhi -110 066
5	Representative from Generating Company (TATA Power Ltd.)	Member	Chief – Core Technology and Diagnostics (CTDS) The Tata Power Co. Ltd. Plot No. C-43, Sector 62, Noida – 201 307, U.P.
6	CPRI representatives	Member	Dr. Saravanan V Joint Director Materials Technology Division CPRI, Bangalore
		Alternate Member	Dr. S K Nath, Joint Director Thermal Research Centre CPRI, Nagpur
7	Chief Engineer-R&D / Director-R&D, CEA	Permanent invitee	Chief Engineer (R&D), CEA, New Delhi
8	CPRI	Member - Convener	Head, R&D Management Division, CPRI, Bangalore

APPENDIX - 5

THE MEMBERS OF TECHNICAL COMMITTEE ON HYDRO RESEARCH AS ON 31ST MARCH 2017

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

APPENDIX - 6

THE MEMBERS OF TECHNICAL COMMITTEE ON TRANSMISSION RESEARCH AS ON 31ST MARCH 2017

Sl. No.	Affiliation	Position	Name
1	Professor from IIT- Kanpur	Chairman	Prof. S. C. Srivastava Department of Electrical Engineering Indian Institute of Technology Kanpur – 208 016
2	ED-BHEL (Transmission)	Member	Shri V K Chohan ED/TBG, BHEL House, Siri Fort New Delhi - 110 049
3	ED-POWERGRID	Member	Shri Sanjeev Singh Executive Director (Technology Development), Power Grid Corp. of India Ltd. "Saudamini", Plot No. 2, Sector-29, Gurgaon–122 001, Haryana
4	Chief Engineer (SETD),CEA	Member	Chief Engineer (SETD) Central Electricity Authority Sewa Bhavan, 3rd Floor, R K Puram Sector -1, New Delhi – 110 066
5	Representative from State Transco (KPTCL)	Member	Shri S. Sumanth Director (Transmission) Karnataka Power Transmission Corpn. Ltd., Kaveri Bhavan, K.G. Road Bangalore – 560 009
6	Representative from IEEMA	Member	Shri Bapu J Amritkar President – Business Head Transformers EMCO Limited, Plot No. F-5, Road No. 28 Wagle Industrial Estate, Thane – 400 604
7	Representatives from CPRI	Member	Smt. K. S. Meera Additional Director, Power Systems Division, CPRI, Bangalore
		Alternate Member	Dr. N. Vasudev Additional Director, High Voltage Division, CPRI, Bangalore
		Alternate Member	Dr. P. M. Nirgude Joint Director, Ultra High Voltage Research Laboratory,CPRI, Hyderabad
8	Chief Engineer-R&D / Director-R&D, CEA	Permanent invitees	Chief Engineer (R&D), CEA, New Delhi
9	CPRI	Member - Convener	Head, R&D Management Division CPRI, Bangalore

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THE MEMBERS OF TECHNICAL COMMITTEE ON GRID, DISTRIBUTION & ENERGY CONSERVATION RESEARCH AS ON 31ST MARCH 2017

Sl. No.	Affiliation	Position	Name
1	Prof. S.V. Kulkarni, Professor IIT - Mumbai	Chairman	Prof. S.V. Kulkarni, FNAE Professor, Department of Electrical Engineering, IIT- Bombay Powai, Mumbai - 400 076
2	Representative from BEE	Member	Shri Ashok Kumar Energy Economist Bureau of Energy Efficiency 4th Floor, Sewa Bhavan R K Puram New Delhi - 110 066
3	Chief Engineer (DP&D) CEA	Member	Chief Engineer (DP&D) Central Electricity Authority Sector -1, 7th Floor, Sewa Bhavan R K Puram, New Delhi - 110 066
4	Representative from MNRE	Member	Dr. P.C. Maithani Director, Ministry of New and Renewable Energy Block 14, CGO Complex, Lodhi Road New Delhi – 110 003
5	Representative from TANGEDCO	Member	Chief Engineer (IC, R&D) TANGEDCO, 4th Floor Eastern Wing, 144 Anna Salai, Chennai – 600 002
6	Representative from IEEMA	Member	Shri P. Ramachandran Technical Advisor, ABB India Ltd. Power Transformer Division Maneja, Vadodara – 390 013
7	Representatives from CPRI	Member	Dr. Amit Jain Joint Director, Power Systems Division, CPRI, Bangalore
		Alternate Member	Shri Sudhir Kumar R Joint Director, Energy Efficiency and Renewable Energy Division CPRI, Bangalore

Sl. No.	Affiliation	Position	Name
		Alternate Member	Shri Jyotibasu S Joint Director Energy Efficiency and Renewable Energy Division, CPRI, Bangalore
8	Chief Engineer-R&D / Director-R&D, CEA	Permanent invitees	Chief Engineer (R&D) CEA, New Delhi
9	CPRI	Member-Convener	Head, R&D Management Division CPRI, Bangalore

APPENDIX - 8

PERSONNEL DEPUTED ABROAD FOR MEETING / CONFERENCE / PRE-DISPATCH INSPECTION OF EQUIPMENT DURING THE YEAR 2016-17

Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
1	Harinath Babu Joint Director CPRI, Bangalore Sudha S Engg. Officer Gr. 4 CPRI, Bangalore	Pre-despatch Inspection and Training of "Three Phase Portable Power with Reference Meter of 0.02 Class Accuracy" at the works of M/s EMH Energie-Messtechnik GmbH	Hamburg, Germany	16th to 21st May 2016
2	M.K Wadhwani Additional Director STDS-CPRI, Bhopal	42nd STL Management Committee Meeting	Budapest, Hungary	23rd & 24th May 2016
3	S Sudhakar Reddy, Joint Director, High Power Laboratory CPRI, Bangalore	Third Party witnessing of tests carried out on 90MVA, 132kV/33kV Transformer at Mechelen, Belgium for M/s.PT CG Power Systems, Indonesia	Mechelen, Belgium	27th June to 7th July 2016
4	B L Jayadev Engg. Officer Gr.2 CPRI, Bangalore	Pre-despatch Inspection of test benches, reference meters and portable sources on Kongiswinter, Germany	Germany	21st to 23rd June 2016
5	R Sudhir Kumar Joint Director CPRI, Bangalore N Rajkumar Engg. Officer Gr.4 CPRI, Bangalore	Pre-despatch Inspection & hands on training on "Sun Simulator", at the works of M/s. Spire Corporation, MA, USA	Bedford, MA, USA	3rd to 5th August 2016
6	M Janardhana Joint Director CPRI, Bangalore R K Kumar Joint Director CPRI, Bangalore	Pre-despatch Inspection and Training programme on "Electromagnetic Technique – NDT System" at the works of TesTex Inc., USA	Pittsburgh, USA	12th to 16th September 2016

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Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
7	Dr. N. Vasudev Additional Director CPRI, Bangalore M. Kanyakumari Additional Director CPRI, Bangalore Jithin Pauly Engg. Officer Gr.2 CPRI, Bangalore	Pre-despatch Inspection and Training on "Upgradation of UHV/ HV test facilities" at the works of M/s. Haefely Test AG	Basel, Switzerland	19th to 23rd September 2016
8	Dr. B Nageshwar Rao Additional Director CPRI, Bangalore	International Electro Technical Commission (IEC) Plenary meeting (IEC Technical Committee 20: Electric Cables) and Working Group WG 16, 17 18, and 19	Rossyln, Virginia, USA.	24th to 28th October 2016
9	Dr. H N Nagamani Additional Director CPRI, Bangalore T.Bhavani Shanker Joint Director CPRI, Bangalore	International Electro-Technical Commission (IEC) Technical Committee (TC) 33 meeting	Milano, Italy	14th to 18th November 2016
10	R Sudhir Kumar Joint Director CPRI, Bangalore N Rajkumar Engg. Officer Gr.4 CPRI, Bangalore	Pre-despatch Inspection & hands on training on "Grid Tied Inverter Test Facility" at the works of M/s. Ametek Programmable Power Inc., San Diego, CA, USA	San Diego, CA, USA	
11	M.K. Wadhwani Additional Director STDS-CPRI, Bhopal S. Sudhakara Reddy Joint Director CPRI, Bangalore	64th STL Technical Committee Meeting	Berlin, Germany	15th & 16th November 2016

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Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
12	Meera KS Additional Director CPRI, Bangalore Kaliappan P Joint Director CPRI, Bangalore	Pre-despatch Inspection and Training of "Phasor Measurement Unit (PMU) testing and calibration system" at the works of M/s. Fluke Precision Measurement Ltd.	Norwich, United Kingdom	5th to 9th December 2016
13	G Girija Engg. Officer Gr.4 CPRI, Bangalore	Pre-despatch Inspection and Training of "Automatic Instrument Transformer Test Set – Current Measurement" at the works of M/s. Zera GmbH	Konigs-winter, Germany	5th to 8th December 2016
14	Sarita Dongre Joint Director STDS-CPRI, Bhopal	Pre-despatch Inspection and Training of "Surge Generator for RCCB/RCBO Testing (Multifunctional Test Generator for Transients)" at the works of M/s. EM Test (Switzerland) GmbH.	Switzerland	13th & 14th December 2016
15	J Santhosh Additional Director STDS-CPRI, Bhopal	14th Asian Meeting of High Power Laboratories (AMHPL)	Xian, China	15th to 16th December 2016
16	Thirumurthy Engg. Officer Gr. 3 CPRI, Bangalore	Pre-despatch Inspection and Training of "500 Hz, 30/60 kV, 750 KVA Elevated Frequency Dielectric Test System" at the works of M/s. HIGHVOLT Pruftechnik Dreseden, GmbH	Germany	12th to 16th December 2016

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Sl. No.	Name & Designation of the officer Shri/Smt./Kum.	Purpose of Visit	Country	Duration
17	Dr. B Nageshwar Rao Additional Director CPRI, Bangalore	Pre-despatch Inspection and Training of "600 kV, 2400 KVA Series Resonant Transformer" at the works of M/s. Phenix Technologies Inc.	MD, USA	12th to 16th December 2016
18	Rajendra Singh Engg. Officer Gr. 3 STDS-CPRI, Bhopal	Pre-despatch Inspection and Training of "High Precision Energy Calibration set up, Model COM 3003 and MT 551" at the works of M/s. ZERA GmbH	Konigs-winter, Germany	26th & 27th January 2017
19	Dr. R Ramesh Babu Director CPRI, Bangalore R.A Deshpande Additional Director CPRI, Bangalore S.Anand Engg. Officer Gr. 3 CPRI, Bangalore	Participation and manning the CPRI Stall in the "Middle East Electricity Exhibition"	Dubai-UAE	13th to 16th February 2017
20	Jothibasu Joint Director CPRI, Bangalore	Pre-despatch Inspection and Training of "Half Moon Light Measurement Set-up" at the works of M/s. Labsphere Inc.	New Hampshire (NH), USA	20th to 24th February 2017

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MEMBERSHIP OF CPRI OFFICERS IN INTERNATIONAL / NATIONAL COMMITTEES

Sl. No.	Name & Designation Shri/Smt./Kum.	Member	Name of the Committee
1	Dr.B.Nageshwar Rao Additional Director CPRI, Bangalore	Chairman	BIS ET -09 Power Cables Committee
		Sr. Member	IEEE, USA
		Member	IEEE, DEIS,USA
			IEC Project team 62985 for DC High voltage cables
			CIGRE
			Working committee group 18 IEC Technical committee 20: Electric Cables
			Panel for preparing the Draft Indian Standard on "On site diagnostic testing for condition/ health assessment of High Voltage Substation equipment'
2	V.V. Pattanshetti Additional Director CPRI, Bangalore	Chairman	BIS Electro Technical Committee ET-03
		Member	BIS Technical Committee ET-43
3	Dr. Varughese K.T Additional Director CPRI, Bangalore	Senior Member	Institution of Electrical and Electronic Engineers (IEEE), USA
		Life Member	Indian Society for Non Destructive Test (ISNT), Chennai
			Indian Society for Analytical Scientists (ISAS), BARC, Mumbai
			Indian Society for Theoretical and Applied Mechanics (ISTM), IIT, Kharagpur
			BIS ET-09 Power Cables Committee
4	Dr. H N Nagamani Additional Director CPRI, Bangalore	Chairperson	IEC TC 33 Power Capacitors and Applications
		Member	Sectional Committee on High Voltage Engineering ET 19 of BIS, New Delhi.
			IEEE
			WIE IEEE
			IEC TC 42 WG14- High Voltage Techniques – Measurement of Partial discharges by

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
			Electromagnetic and Acoustic methods – IEC 62478
			CIGRE Working Group D1.55
5	A.R.Ravikumar Additional Director CPRI, Bangalore	Member	BIS Member for Technical Committee on Refrigerator and Air conditioning
			National Steering Committee (NSC) for the project on National Mission on Power Mission on Power Electronics Technology Phase-II (NaMPET-II)
6	Dr. N. Vasudev Additional Director CPRI, Bangalore	Chairman	BIS Technical Committee High Voltage Engineering ETD-19
		Principal Member	BIS Technical Committee for Electrical Insulators & Accessories Sectional Committee-ETD 06
			Basic Electro Technical Standards Sectional Committee ETD-01
		Member	IEEE
			CIGRE National Committee Member for Overhead Lines,
			BIS Technical Committee for Electrical Insulators & Accessories
			Sectional Committee, ET 06
7	S Ganga Additional Director CPRI, Bangalore	Chairman	Gender Budgeting Cell
		Member	Solid Electrical Insulating Materials & Insulating Systems Sectional Committee-ET-02
		Represent-ative from CPRI	Working Group comprising of NTPC (convener) and other members from NHPC, PGCIL, CEA and ERDA to prepare draft revision of IS 15652 in line with the latest developments at international level
8	M. Kanyakumari Additional Director CPRI, Bangalore	Chairman	BIS ETD-30 Committee on Surge Arresters Sectional Committee
9	A Amruthakala Additional Director CPRI, Bangalore	Member	BIS Power System Relays Sectional Committee ET-35

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
10	Anupam Awasthi Additional Director CPRI, Bangalore	Chairman	BIS Sectional Committee on Low Voltage Switchgear and Controlgear, ET-07
		Member	IEEE
			Institution of Engineers (India)
		ASTA Observer	Intertek, UK
11	Meera K.S Additional Director CPRI, Bangalore	Principal Member	HVDC Power Systems Sectional Committee, ETD 40
			Power System Control and Communications Sectional Committee, LITD 10, its Panels
			LVDC Distribution Systems and Micro Grid Sectional Committee, ETD 50
		Member	IEEE
12	Dr. J. Sundara Rajan Additional Director CPRI, Bangalore	Chairman	BIS Sectional Committee on Winding Wires
		Senior Member	IEEE, USA
		Member Convener	Technical Committee on Hydro
			Technical Committee on Thermal
			Technical Committee on Transmission
			Technical Committee on Grid, Distribution & Energy Conservation
13	R.A. Deshpande Additional Director CPRI, Bangalore	Chairman	BIS Committee ETD 16- Transformers
		Senior Member	IEEE
14	J. Santhosh Additional Director & Unit Head STDS-CPRI, Bhopal	Chairman	Basic Electrotechnical Standards and Power Quality Sectional Committee ETD-01 of BIS
15	M.K. Wadhwani, Additional Director STDS-CPRI, Bhopal	Member	High Voltage Switchgear & Control Gear Sectional Committee ETD-08 of BIS
			Fuses Sectional Committee BT 39
			Power Transformer ETD- 16 of BIS
16	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

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
			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
		Principal Member	Standing Committee to investigate the failure of equipments at 220kV and above sub-stations
		Member	Sectional Committee- Electrical Insulators and Accessories, ET-06
			IEEE and also ASTA observer
17	B.A. Sawale Additional Director STDS-CPRI, Bhopal	Senior Member	IEEE
		Corporate Member	IETE
		Member & Convener of Panel	BIS ET-13
		Member	Expert Committee of Energy Metering- CBIP
			IEC TC13/WG11, WG14, WG15
18	M.A. Ansari Additional Director NHPTL, Bina	Member	BIS Technical Committee for LT Switchgear & Controlgear
19	D.K. Grover Additional Director UHVRL-CPRI, Hyderabad	Member	CBIP Committee Manual on Busduct
20	S. Sudhakara Reddy Joint Director CPRI, Bangalore	Principal Member	Work of Electrical Traction Equipment Section Committee, ETD-47 of BIS
		Member	BIS Committee on Transformers ETD-16
			BIS Committee on High Voltage Switchgear and Controlgear Sectional Committee, ETD-08

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
21	S. Shyam Sundar, Joint Director CPRI, Bangalore	Principal Member	ETD 01 Basic electro technical standards and ETD 45 power quality
		Member	IEEE
		Expert Member	Member of CEA Expert committee constituted for formulation of criteria for planning of Distribution Systems.
		Alternate Member	ETD – 50 New Committee on LVDC and Micro Grid
22	T.R.Venkatesh Joint Director CPRI, Bangalore	Fellow	Institute of Engineers
23	T.Bhavani Shanker Joint Director CPRI, Bangalore	Chairman	Sectional Committee on Power Capacitors ET 29 of BIS, New Delhi
		NDT Level I Certified Engineer	Acoustic Emission testing as per American Society for Non-destructive testing (NDT)
		Member	Technical Evaluation Committee for setting up of calibration facility for C & tan delta bridges at NPL, New Delhi
			WG 14 "Series capacitors for Power systems" under IEC/TC 33
		Alternate Member	Environmental testing procedures Sectional Committee LITD 01 of BIS
24	V N Nagaraja Rao Joint Director CPRI, Bangalore	Member	BIS ETD-03 Technical Committee
25	D Ravindra Joint Director CPRI, Bangalore	Member	BIS ETD-03 Technical Committee
26	K.P. Meena Joint Director CPRI, Bangalore	Principal Member	BIS ET-09 Power Cables Committee
27	R. Sudhir Kumar Joint Director CPRI, Bangalore	Principal Member	BIS-Sectional Committee ETD-23 "Electric Lamps and their Auxiliaries"
			BIS-Sectional Committee ETD-28 "Solar Photovoltaic Energy Systems"

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
		Life Member	Society of Energy Engineers and Managers
		Member	Toastmasters International
		Alternate Member	New Committee on Electrical Energy Storage (Grid connected large scale)
		Certified "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
28	S. Jothibasu Joint Director CPRI, Bangalore	Principal Member	BIS, Solar Pumps Committee
			BIS ETD 15 Committee on Ceiling fans
		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)
			Solar Energy Society of India (SESI)
		Member	Certified Internal Auditor of ISO 9001
			RC for National Institute of Wind Energy (formerly CWET)
29	Gujjala B Balaraju Joint Director CPRI, Bangalore	Member	BIS Technical Committee on Refrigerator
			BIS Technical Committee on Air conditioning
30	D. Revanna Joint Director CPRI, Bangalore	Main Member	Panel of experts on manual on Transmission lines, CBI & P, New Delhi
		Alternate Member	Sub Committee – CED 7:1 of BIS, New Delhi- "Use of steel in over lead line towers and switch yard structure and masts for telecommunication and flood lighting
		Member	Standing committee of experts to investigate Cause of failure of towers, Central Electricity Authority (CEA) New Delhi.
			BIS Committee ET 37, IEC/TC7 & TC11- Conductors and Accessories on Overhead Lines

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
31	M.D. Anantha Babu Joint Director CPRI, Bangalore	Principal Member	BIS Committee ET 37, IEC/TC7 & TC11- Conductors and Accessories on Overhead Lines
32	Dr. M. Selvaraj Joint Director CPRI, Bangalore	Life Member	Institution of Engineers (I), Kolkata MIE
		Main Member	Subcommittee- – CED 7:1 of BIS, New Delhi - Use of steel in over lead line towers and switch yard structure and masts for telecommunication and flood lighting"
		Alternate Member	Panel of experts on manual on Transmission lines - CBI & P, New Delhi
		MIE – Life member	Institution of Engineer (I) Kolkata
		Individual Member	SCB2 Overhead lines, CIGRE, Paris
33	D.M. Gourkhede Joint Director NHPTL- Bina	Life Member	Indian Ceramic Society
34	P.V. Harinathbabu Joint Director CPRI, Bangalore	Principal Member	Measuring equipment for basic electrical quantities
35	M. Janardhana Joint Director CPRI, Bangalore	Member	Indian Society of Non-Destructive Testing
		Alternate Member	ETD-44- Safety of Machinery
36	Dr. M. Venakteswara Rao Joint Director CPRI, Bangalore	Principal Member	Standardization of environmental aspects ETD 23
		Member	Indian Society of Non-Destructive Testing
37	Dr. V. Saravanan Joint Director CPRI, Bangalore	Life time Member	Combustion Institute Pittsburg, USA.
		Alternate Member	Clay and Stabilised soil products for construction, CED 30

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
38	P.Sadashiva Murthy Joint Director CPRI, Bangalore	Alternate Member	BIS Sectional Committee ETD-02
39	S. Vynatheya Joint Director CPRI, Bangalore	Life Member	Indian Society of Analytical Scientists, Mumbai
			Indian Ceramic Society
		Member	Indian Institute of Ceramics, Kolkata
		Alternate Member	MTD-4, BIS
			Flat Steel Products Subcommittee, MTD 4:3
40	Dr. P. Chandra Sekhar Joint Director CPRI, Bangalore	Member	Board of Studies Sri Vidyaniketan Engineering College, Department of Electrical Engineering, Tirupathi
		Alternate Member	ETD-01 Basic Electro Technical Standards and Power Quality
41	Dr. Amit Jain Joint Director CPRI, Bangalore	Principal Member	BIS-LITD10 (Power System Control and Associated Communications Sectional Committee)
		Life Member	Computer Society of India
			Institution of Engineers, India
			Indian Wind Energy Association
			Indian Society for Technical Education
		Member	IEEE, Power & Energy Society
			BIS-ET 46 (Grid Integration of Renewables)
			Project Review Committee (PRC-1) for NaMPET Phase-II
42	J. Sreedevi Joint Director CPRI, Bangalore	Principal Member	BIS - Wind Turbines Sectional Committee ETD 42
			CIGRE Study Committee B4.72, DC Grid Benchmark Models for System Studies
		Member	IEEE
		Alternate Member	HVDC Power Systems Sectional Committee, ETD 40
			BIS ETD-50 Committee on LVDC and Micro Grid
43	P Kaliappan Joint Director CPRI, Bangalore	Principal Member	BIS ETD 35 Power Systems Relaying Committee
		Secretary	Panel 4 of LITD 10 PMU panel for PMU Testing and Certification

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
		Professional Member	IEEE
		Member	IEEE PES Bangalore Section
			BIS-LITD-10, WP2-Security
44	G.R. Viswanath Joint Director CPRI, Bangalore	Alternate Member	BIS Technical Committee ET-03 on Electro Technical Fluids
			BIS Technical Committee ET-43
45	S. Bhattacharya Joint Director CPRI- RTL, Noida	Member	BIS committee on Instrument Transformers ET-34
			BIS committee Low Voltage Switchgear & Controlgear ET-07
46	Manoher Singh Takkher Joint Director STDS-CPRI, Bhopal	Member	Highvoltage Switchgear & Control gear Sectional Committee ETD-08 of BIS
47	Sumbul Munshi Joint Director STDS-CPRI, Bhopal	Member	BIS Committee on Low Voltage Switchgear & Controlgear ET-07
48	Sarita Dongre Joint Director STDS-CPRI, Bhopal	Member	The Institution of Engineers (India), Kolkata
49	Swaraj Kumar Das Joint Director CPRI, Bangalore	Member	BIS Sectional Committee, ET 34 & ET 07
50	Rajesh Ranjan Joint Director TRC-CPRI, Koradi	Life Member	Indian Society for Technical Education (ISTE)
		Member	Indian Society for Non- Destructive Testing (ISNT)
51	Dr. Pradeep M Nirgude Joint Director UHVRL-CPRI, Hyderabad	Principal Member	ET-48 -BIS- UHV AC Transmission Systems - Sectional Committee
			ET-19-BIS- High Voltage Engineering Sectional Committee
			ET- 36 – BIS- Sectional Committee on Tools & Equipment surge for live working
			BIS ETD-30- Surge Arresters Sectional Committee
			Technical Committee on Transmission Research of Standing Committee on Research & Development

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
		Member	Institute of Electrical and Electronics Engineers (IEEE)
			Standing Committee on Research and Development (SCRD)
			Working Group on power transformers formed by POWERGRID for 1200kV test station at Bina, Madhya Pradesh
		Alternate Member	Indian National Committee
			Basic Electro Technical Standards Sectional Committee ETD – 01
			Working Group WG-1 on Valve Electronics on indigenous development of HVDC/FACTS components formed by PGCIL. (POWERGRID)
52	N. Rajkumar Engg. Officer Gr.4 CPRI, Bangalore	Principal Member	BIS Safety of Machinery Sectional Committee (ETD 44)
		Life Member	Solar Energy Society of India (SESI)
			Society of Energy Engineers and Managers (SEEM)
		Expert Member	Excellence Enhancement Centre for Indian Power Sector (An Indo German Energy Co-operation), CEA, New Delhi
		Alternate Member	BIS Lamps and related equipment Sectional Committee (ETD 23)
			BIS Solar Photo-voltaic energy Sectional Committee (ETD-28)
			BIS Solar Pumps Sectional Committee
			BIS ETD-15 - Ceiling Fans
		Accredited "Energy Auditor and Energy Manager"	Bureau of Energy Efficiency, Ministry of Power, Govt. of India
53	V. Asaithambi Engg. Officer Gr.4 CPRI, Bangalore	Member	BIS Sectional Committee, ET-33

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
54	R. Manohara Engg. Officer Gr.4 CPRI, Bangalore	Alternate Member	ETD-50 New Committee on LVDC and Micro Grid
55	Yugal Agrawal, Engg. Officer Gr. 4 STDS-CPRI, Bhopal	Member	Peer Group for review of course content of training themes for capacity building under R-APDRP for Power Finance Corporation, Delhi.
		Alternate Member	BIS Sectional Committee ETD-47, Electrical Traction Equipments
56	Dr. M.G.Ananda Kumar Engg. Officer Gr.4 CPRI, Bangalore	Life Member	Indian Ceramic Society
			Indian Society of Analytical Scientists
		Member	Indian Institute of Ceramics, Kolkata
57	G. Kishore Kumar Engg. Officer Gr.4 CPRI, Bangalore	Principal Member	Clay and Stabilised soil products for construction, CED 30 of BIS
			Flat Steel Products Subcommittee, MTD 4:3 of BIS
		Life Member	Indian Society of Analytical Scientists, Mumbai
		Life Associate Member	Indian Institute of Chemical Engineers, Kolkata
		Executive Member	Bangalore Regional Center of IIChE
58	A. K. Khanra Engg. Officer Gr.4 STDS-CPRI, Bhopal	Member	The Institution of Engineers (India), Kolkata
			Solar Energy Society of India (SESI), New Delhi
		Life Member	Society of Energy Engineers & Managers (SEEM), Thiruvananthapuram
		Technical Assessor	NABL, Gurgaon
59	G. Girija Engg. Officer Gr. 4 CPRI, Bangalore	Principal Member	BIS Sectional Committee for Environmental Conditions Testing Procedures for Electronic Products – LITD 01
60	V.Suresh Engg. Officer Gr. 4 CPRI, Bangalore	Member	BIS ET-13, Metering Panel-1
		Alternate Member	ETD 01 Basic electro technical standards and ETD 45 power quality

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
61	Shivakumar V Engg. Officer Gr.4 CPRI, Bangalore	Alternate Member	New Committee on Smart Grid
		Member	IEC TC-57/WG15 (Security)
			BIS-LITD-10
			ISGF-WG10 (Security)
			ISGAN - Annex 4 & Annex 5 (SIRFN)
		Convenor	LITD 10 - WP2- (Security)
62	Dr. S.K.Nath Engg. Officer Gr.4 TRC-CPRI, Koradi	Life Member	Indian Society for Non-Destructive Testing (ISNT)
		Member	American Society of Mechanical Engineers (ASME)
		Alternate Member	Technical Committee on Thermal Research of Standing Committee on R&D (SCRD) of Min. of Power, Govt. of India
		Executive Body Member	ISNT – Nagpur Chapter
		Fellow	Institution of Engineers (India)
		Supervisor for PhD	Rashtrasant Tukadoji Maharaj Nagpur University (RTMNU)
63	U. S. Joshi Engg. Officer Gr.4 TRC-CPRI, Koradi	Member	American Concrete Institute, Mumbai
		Life Member	Indian Society for Non-Destructive Testing (ISNT), Chennai
64	K. A. Aravind Engg. Officer Gr.4 UHVRL-CPRI, Hyderabad	Alternate Member	BIS ETD-19 - High Voltage Engineering
65	Dr. Kuldeep Singh Rana Scientific Officer Gr.3 CPRI, Bangalore	Principal Member	BIS ETD 10 & 11, for Primary, Secondary Cell and Batteries
			BIS Member for New Committee on Electrical Energy Storage (Grid connected large scale)
66	Dharmesh Yelamanchi Engg. Officer Gr.3 CPRI, Bangalore	Member	IEEE
		Alternate Member	Sectional Committee, ET 06, BIS
			Sectional Committee, ET 19, BIS
			Sectional Committee, ETD 48, BIS

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
67	Dr. Manohar Singh Engg. Officer Gr.3 CPRI, Bangalore	Senior Member	IEEE, Power & Energy Society
			IEEE
		Alternate Member	BIS - Wind Turbines Sectional Committee ETD 42
			ETD 35 Power Systems Relaying Committee
68	Thirumurthy Engg. Officer Gr.3 CPRI, Bangalore	Alternate Member	BIS ET -09 Power Cables Committee
69	V Vaidhyanathan Engg. Officer Gr.3 CPRI, Bangalore	Principal Member	Power Capacitors Sectional Committee ET 29 of BIS
70	Saumitra Pathak Engg. Officer Gr.3 STDS-CPRI, Bhopal	Life Member	Indian Society for Technical Education
71	Priyamvada Chandel Engg. Officer Gr. 3 STDS-CPRI, Bhopal	Life Member	ISTE
			The Institution of Engineers (India), Kolkata
72	Sukumar Peta Engg. Officer Gr.3 STDS-CPRI, Bhopal	Member	The Institution of Engineers (India), Kolkata
73	Rajendra Singh Engg. Officer Gr.3 STDS-CPRI, Bhopal	Member	The Institution of Engineers (India), Kolkata
		Life Member	Metrology Society of India, NPL, New Delhi
			Society of Energy Engineers & Managers (SEEM), Thiruvananthapuram
74	Pradish M Engg. Officer Gr.3 CPRI, Bangalore	Corporate Member	UCA, IUG, USA
		Member	BIS ETD13
			BIS ETD Panel 1 & Panel 4
			BIS LITD Panel 1 & panel 3
			IEEE P2030.10: DC Microgrids for Rural and Remote Electricity Access Applications
		Alternate Member	New Committee on Smart Grid
75	Shaileshwari M U Engg. Officer Gr.3 CPRI, Bangalore	Member	BIS LITD 10 WP 2 on security
			ISGF-WG10 (Security)

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Sl. No.	Name & Designation	Member	Name of the Council / Committee
76	Dr.Neha Adhikari Engg.Officer Gr.3 RTL-CPRI, Noida	Member	IEEE
77	K. Suryanarayana Engg.Officer Gr.3 CPRI, Bangalore	Associate Member	The Institution of Engineers (India)
		Life Member	The Indian Ceramic Society
			Indian Society of Analytical Scientists
		Member (Elected)	Indian Institute of Ceramics
78	Mridula Jain Engg.Officer Gr.3 RTL-CPRI, Noida	Member	CIM Working Group under LITD-10 under BIS
79	S.P.Kalambe Engg.Officer Gr.3 STDS-CPRI, Koradi	Member	Institution of Engineers (India)
			Indian Society of Heating, Refrigeration & Airconditioning Engineering (ISHRAE)
		Life Member	Indian Society for Non-Destructive Testing (ISNT)
80	Ramadas Engg. Officer Gr.2 CPRI, Bangalore	Member	IPV 6 Committee
81	Dr.N.Moumita Naskar Scientific Officer Gr.2 CPRI, Bangalore	Principal Member	ETD 33 Winding wires
82	Ramesh Patil Engg. Officer Gr.2 CPRI, Bangalore	Member	BIS LITD 10 Group Adoption CIM for Indian Utility
83	Jithin Pauly P Engg. Officer Gr.2 CPRI, Bangalore	Alternate Member	BIS ETD-30 Committee on Surge Arresters Sectional Committee
84	D. Venkatesh Engg. Officer Gr.2 CPRI, Bangalore	Principal Member	BIS ETD-32 Committee for Electrical Appliances
85	Smarajit Patra Sr.Accounts Officer UHVRL-CPRI, Hyderabad	Associate Member	Institute of Cost Accountants of India

APPENDIX - 10

Papers presented / published indicating Event / Venue / Journal for 2016-17

Cables & Diagnostics Division

Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
1	CPRI experience in diagnostic testing and condition assessment of medium voltage power cable system	Dillip Kumar Puhan Chandrashekhar D Keri Dr. B Nageshwar Rao	14th India Doble Power Forum on High Voltage Asset Management, held at Surya Palace Hotel, Vadodara, from 29th November to 3rd December 2016.
2	Classification of Partial discharge sources in Mica-Epoxy –Glass insulation sample using statistical Analysis	Ramesh P. Nair Dr. B Nageshwar Rao Dr. B. V. Sumangala Chandrashekhar D Keri	Asian Conference on Electrical Discharge held at IIT, Madras, from 8th to 10th December 2016
3	Hydro Generator Insulation System - Option for life extension with few case studies	Dr. B Nageshwar Rao Chandrashekhar D Keri	Workshop on Renovation, Modernization, Uprating & Life Extension of Hydro Power Plant-Diverse Issues & Handling Strategies, held at CEA, New Delhi, on 16th December 2016
4	Fire Retardancy characteristics and Mechanical properties of high density polyethylene/ultra fine fly ash/MWCNT nano composite	V.C.Divya M. Ameen Khan Dr. B Nageshwar Rao R. Shailaja	Journal Polymer – Plastics Technology & Engineering December 2016
5	Pulse characteristics and pattern analysis of corona discharges with different press board insulation barriers	Muhammed Faisal Rahman Dr. B Nageshwar Rao Dr. Pradeep M Nirgude	18th Asian Conference on Electrical Discharge (ACED-2016), held at IITM- Chennai, from 8th to 10th December 2016
6	Level dependent partial discharge single denoising using stationery wavelet transform	Jayakrishnan.M Dr.B Nageshwar Rao	

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
7	Condition assessment techniques for insulation diagnosis of oil filled power transformer in service – Few case studies	Dillip Kumar Puhan Chandrashekhar D Keri Dr. B. Nageshwar Rao	2nd National Conference on High Voltage Engineering & Technology (NCHVET-2017), held at CPRI, Bangalore, on 27th & 28th January 2017
8	Moisture determination of transformer insulation by frequency domain dielectric response measurement	Manas Ranjan Patra Dr. B. Nageshwar Rao	
9	On-Site Partial Discharge Diagnosis of Power cables-Case Studies and Field Experiences	Dillip kumar Puhan Chandrashekhar D Keri Dr. B. Nageshwar Rao	9th International Conference on Power Cable Technology CABLETECH 2017, held at CPRI, Bangalore, on 9th & 10th February 2017
10	Characterization & Analysis of Cable and Cable Accessories Materials	R. Arunjothi M.Jayakrishnan Dr.B. Nageshwar Rao	
11	CPRI experience in Laboratory Evaluation of Power Cable accessories	K.P. Meena Thirumurthy P.V. Satheesh Kumar G.K. Raja Dr. B. Nageshwar Rao	
12	Development of a lab scale YBCO based High Tc Superconducting Power cable	T. Sudheer Dr. B. Nageshwar Rao Dr. J. Sundara Rajan V. V. Rao	26th National Symposium on Cryogenics and Superconductivity, held at Kolkata, from 22nd to 24th February, 2017
13	Contact angle studies in XLPE hybrid nanocomposites with inorganic nanofillers	Josmin P. Jose Jiji Abraham Hanna J. Maria Dr. K.T. Varughese Sabu Thomas	The Journal of Macromolecular Symposia, Vol. No. 366 Issue No.1, Page Nos. 66-78, Publication Date: 2016/8/1
14	Natural Polyisoprene composites and their electronic applications	Deepalekshmi Ponnamma Kishore Kumar Sadasivuni Dr. K.T. Varughese Sabu Thomas Mariam Al-Ali AlMa' adeed	Book-Flexible and stretchable Electronic Composites, Page Nos.1-35, Publisher: Springer International Publishing, 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
		Capacitors Division	
15	Inrush current parameters associated with back-to-back switching of capacitors in a bank	Dr.H.N.Nagamani Meghana Ramesh V. Vaidhyanathan Dr. G. S. Punekar	International Journal on Electric Power Components and Systems (Taylor and Francis, London), Volume: 45(3), Year: 2017, Page Nos. 279-287
16	Acoustic Emission Partial Discharge Detection Technique Applied to Fault Diagnosis Case Studies of Generators Transformers	T. Bhavani Shanker Dr. H.N. Nagamani Dr. G. S. Punekar	International Journal in Serbian of Electrical Engineering in June 2016
17	Behaviour of Porcelain clad outdoor VCB's under very cold climatic conditions	V. Vaidhyanathan Dr. H. N. Nagamani	Two days "National seminar on emerging trends in switchgear technology and testing requirements of LT & HT Switchgear and Controlgear", held at CPRI, Bangalore, on 8th & 9th December 2016
18	Performance of HV Shunt Capacitors at sub-ambient temperatures during switching transients	T. Bhavani Shanker V. Vaidhyanathan Dr. H. N. Nagamani	2nd National Conference on High Voltage Engineering & Technology (NCHVET-2017), held at CPRI, Bangalore, on 27th & 28th January 2017
19	Determination of temperature co-efficient of coupling capacitor used in CVTs	V. Vaidhyanathan T. Bhavani Shanker Dr. H. N. Nagamani	
20	Acoustic emission detection technique for on-line testing of OLTC	T. Bhavani Shanker V. Vaidhyanathan Dr. H. N. Nagamani	
21	Modeling of hybrid ultra-capacitors for power electronic applications using PSPICE/ORCAD	Pradeep Kumar Rao J Dr. H.N. Nagamani	The Journal of CPRI, Vol. 12, Issue No. 3, September 2016, paper no.16, pp.547-553
		Dielectric Materials Division	
22	Evaluation of physical and electrical properties of Pongamia Pinnata Oil as alternate to mineral insulating oil	Ann Pamla Cruze	2nd National Conference on High Voltage Engineering and Technology (NCHVET) 2017, held at CPRI, Bangalore, on 27th & 28th January 2017

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
23	Visible light driven multifunctional photocatalysis in TeO2-based semiconductor glass ceramics	H. S. Kushwaha Dr. P. Thomas Rahul Vaish	J. Photon. Energy. 7(1), 016502 (21st February 2017), DoI:10th November 2017/1.JPE.7.016502
24	High permittivity Nylon 11/CaCu3Ti4O12 (CCTO) nanocrystal composites for capacitors application	Dr. P. Thomas R. S. Ernest Ravindran S. Renganathan	IEEE Conference on Electrical Insulation and Dielectric Phenomena, held at Toronto, Ontario, Canada, from 16th to 19th October 2016.
25	Improved dielectric constant of thermoplastic blend as a function of alumina loading	Aditya Kadian Sampann Arora Akshath Sharma Girish M. Joshi Mayank Pandey Anji Polu Reddy M. J. Joshi Dr.P. Thomas	Measurement, Vol: 90, Page: 461–467,Year :May, 2016
26	Electrical properties and thermal degradation of poly(vinyl chloride) / polyvinylidene fluoride/ZnO polymer nano composites	Mayank Pandey Girish M Joshi Amitava Mukherjee Dr. P. Thomas	Polymer International Journal, DOI: 10.1002/pi.5161, Year :June, 2016
27	Dielectric relaxation of nano perovskite SrTiO3 reinforced polyester resin/styrene blend for electronic applications	Moumita Khutia Girish M. Joshi Dr. P. Thomas	Journal of Materials Science: Materials in Electronics, July 2016, Volume 27, Issue 7, pp 7685–7692
28	EVA (Ethylene-Co- Vinyl Acetate) Composites in Nanoscale: "Research Methodology and Developments"	Gnanasekaran. D P. H. Massinga Jr W.W. Focke	Nekane Guarrotxena (Ed.) Research Methodology in Physics and Chemistry of Surfaces and Interfaces, Pg, 39-728 ISBN: 13:978-1-4822-4097-9, 2016, Chapter 3

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
29	Vegetable Oil based Bio-lubricants and Transformer Fluids - Applications in Power Plants	Dr.D.Gnanasekaran Dr. Chavidi Venkata Prasad	Series Title: Materials Forming, Machining and Tribology Book Title: Vegetable Oil based Bio-lubricants and Transformer Fluids Book Subtitle: Applications in Power Plants Publisher: Springer, Singapore. Pages: 1-155. ISBN: 978-981-10-4869-2 DOI: 10.1007/978-981-10-4870-8
Electrical Appliances Technology Division			
30	Additive-free synthesis of Li4Ti5O12 nanowire arrays on freestanding ultra thin graphite as a hybrid anode for flexible lithium ion batteries	Dr. Kuldeep Rana	Journal of Materials Chemistry-A Royal Society of Chemistry Vol. 4, (2016), pp. 19197-19206
31	Synthesis of Additive Free Electrode Material of Supercapacitor for Energy Storage Applications	Dr. Kuldeep Rana	International Conference on Industrial & Information Systems (ICIIS-2016), held at IIT, Roorkee, on 3rd & 4th December 2016
Energy Efficiency and Renewable Energy Division			
32	Managing coal fired thermal power plants efficiency	M. Siddhartha Bhatt N. Rajkumar	Electrical India, Vol.56, No.8, August 2016, pp.22-40
33	Energy conservation in pumping systems of HVAC Systems	S. Jothibasu	Cooling India, Vol. 12, No. 2, pp. 50-53, September 2016
34	Effect of load variation and atmospheric conditions on performance of Solar PV inverters	Vani Vijay R. Sudhir Kumar P. Giridhar Kini	Innovation and Technology Summit, SWITCH Global Expo, pp 107-113, Vadodara, held from 6th to 10th October, 2016.
35	Design of module level power electronic device	P. Elanchezhian V. Kumar Chinnaiyan	

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
36	Micro controller Programming for PWM control of MOSFET based converters	Vani Vijay P. Giridhar Kini R. Sudhir Kumar	The Journal of CPRI, Vol. 12, Issue no. 3, pp.511-515, September 2016
37	Maximum annual savings in radial distribution systems using firefly algorithm	Dinakara Prasad Reddy P B. Chandrasekhar	The Journal Of CPRI - Vol. 12, Issue no. 3, pp.481-486, September 2016
38	Single-Ended Resonant Inverter for Photovoltaic Applications	P. Elanchezhian V. Kumar Chinnaiyan	The Journal of CPRI - Vol. 12, No. 3, pp.555-559, September 2016
39	Enhancing performance of cooling tower	N. Rajkumar	Published in Cooling India, Vol 12, Issue no. 6, pp 66-68, January 2017
40	Interleaved Flyback Micro Inverter Based Solar Photovoltaic Power Generation System	P. Elanchezhian V. Kumar Chinnaiyan R. Sudhir Kumar	The Journal of CPRI - Vol. 12, Issue no. 2, pp.241-244, June 2016.
41	A novel Grey Wolf optimization algorithm for optimal DG units capacity and location in microgrids	P. Dinakara Prasad Reddy V.C. Veera Reddy T. Gowri Manohar B. Chandrasekhar	The Journal of CPRI - Vol. 12, Issue no. 2, pp.219-226, June 2016
42	A simple variable THD load emulation technique for performance evaluation of power supply equipment	Vani Vijay P. Giridhar Kini Dr.C. Viswanatha	The Journal of CPRI, Vol. 12, Issue no. 2, pp. 245-250, June 2016.
Earthquake Engineering & Vibration Research Centre			
43	Seismic Qualification of LT Switchgear	R. Panneer Selvam Dr. R. Ramesh Babu	Two days Seminar on "Emerging Trends in Switchgear & Control gear" organized by CPRI, Bhopal, on 8th & 9th December 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
44	Seismic Qualification of Substation Equipment by Shake Table Test	R.Panneer Selvam Dr.R.Ramesh Babu	A day Seminar on "Design and Testing of Transmission line Components and Accessories (DTTCA2017)", held at CPRI, Bengaluru, on 20th January 2017
45	Seismic Qualification of High Voltage Circuit Breaker	R.Panneer Selvam Dr.R.Ramesh Babu	2nd National Conference of High Voltage Engineering & Technology (NCHVET 2017) held at CPRI, Bengaluru, on 27th & 28th January 2017
	High Voltage Division		
46	Influence of profile on pollution performance of Cap and Pin Insulator, An experimental study	S Shanmugam Dr.N Vasudev Dr. K.N. Ravi K.A. Venkatesh	IEEE Electrical Insulation Magazine, Vol.32, No.6, pp.20-28, November/December 2016
47	Decomposition kinetics in solid insulation of transformer	Aruna M Dr. K N Ravi Dr. N Vasudev	International Journal of Advanced Computing, Engineering and Application (IJACEA), ISSN: 2319-281X, Vol. No.5, September-October 2016
48	Thermal Behavior of Metal Oxide Surge Arrester Block	Leela A.M V. Muralidhara Dr. K.N. Ravi Dr. N Vasudev	International Journal of Computer Technology and Applications (IJCTA), 9(32), 2016, pp. 183-188, ISSN: 0974-5572 at International Science Press
49	Influence of profile on the pollution performance of cap-and-pin insulators-an experimental study	S Sudalai Shunmugam Dr.N. Vasudev Dr.K.N. Ravi K.A. Venkatesh	IEEE Electrical Insulation Magazine, Vol.32, Issue: 6, pp.20-28, (Dol. 10.1109/MEI.2016.7656807) November /December 2016
50	Simulated Surge Arrester Operation Test on Control Electronic Elements of Mid-Line	Dharmesh Yellamanchi	Seminar on 'Emerging Trends in Switchgear Technology and Testing Requirements of LT & HT Switchgear & Control gear",

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
	Distribution Fault Interrupters		held at CPRI, Bangalore, on 8th & 9th December 2016.
51	Combating of Severe Pollution problems on transmission line without the need for composite insulators	Rafiq Mathersa Asaithambi V Gobinath G Dr. N Vasudev	2nd National Conference on "High Voltage Engineering and Technology (NCHVET)-2017 , held at CPRI, Bangalore, on 27th & 28th January 2017
52	Simulated Surge Testing on Reclosers: Indian Est Lab Experience	Dharmesh Yellamanchi Co-authors Dr.Vijay Shah Satyen Jadhav M/s. ABB, India	
53	The deterioration reaction rate in transformer solid insulation using XRD analysis techniques	Aruna M, Ph.D.Scholar, JNTU, Hyderabad Dr. N Vasudev Dr. K N Ravi Sapthagiri College of Engineering	
54	Covered conductors: A solution for right of way in High Voltage Transmission System	V Sasikumar Dr. N Vasudev	
55	Experimental study on surface erosion and brittle fracture of FRP rod in polymeric insulators	Nagaraj H P Dr.K N Ravi Dr.N Vasudev	
56	Switching over voltages in UHV System	Puneeth Bhurath Dr. N Vasudev Meera K.S	
57	Estimation of critical resistive leakage current of polymer house, ZnO Surge Arrester by Electro Thermal Modeling	Likitha S Kanyakumari M Jithin Pauly P Dr. R S Shivakumara Aradhya Dr.N Vasudev	Journal of Electrical Systems and Information Technology, Published : December 2016, Available online from 28th December 2016, DOI No.: https/doi.org/ 10.10.16/j.jesit.2016.12.010

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
	High Power Laboratory		
58	An examination of TRV under various circuit conditions	Sreeram V S. Sudhakara Reddy Rajaramamohanarao Chennu Arun Kumar S Maroti Anupam Awasthi	Seminar on "Emerging Trends in Switchgear Technology and Testing Requirements of LT & HT Switchgear & Control gear", held at CPRI, Bangalore, on 8th & 9th December, 2016
59	Application of vacuum circuit breakers in high voltage circuits and its challenges	Arunkumar S AnupamAwasthi S Sudhakara Reddy Gurudev T Maroti Rajaramamohanarao Chennu Rajkumar Sreeram V	
60	A review of CIGRE enquiries on circuit breaker reliability	Sreeram V S. Sudhakara Reddy Rajarama mohanarao Chennu Arun Kumar S Maroti Anupam Awasthi	
61	Requirements of Synthetic Circuits for Circuit Breaker Testing	Rajaramamohanarao Chennu S Sudhakara Reddy Sreeram V Maroti Anupam Awasthi	
62	Factors influencing the Dynamic Contact Resistance - A Review	Rajaramamohanarao Chennu S Sudhakara Reddy Sreeram V Maroti Anupam Awasthi	

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
63	A study of electromagnetic induction in HVDC lines from parallel AC lines under short circuit conditions	Sreeram V S. Sudhakara Reddy	The Journal of CPRI - Vol. 12, Issue no. 2, pp.173-177, June 2016
64	Critical aspects and design considerations transformer short circuit testing	Rajaramamohanarao Chennu S. Sudhakara Reddy Anupam Awasthi	National Transformer Technology Symposium, held at World Trade Center, Bangalore, on 9th & 10th August 2016
65	Effects of transformer saturation during short circuit tests-experience of CPRI	Rajaramamohano Chennu S. Sudhakara Reddy Arun Kumar S Sreeram V Maroti Anupam Awasthi	14th International Conference on Global trends in Transformer Technology for Indian Power System, held at New Delhi, on 5th May, 2016
66	Transformer short circuit withstand and its failure analysis	Rajaramamohanarao Chennu S. Sudhakara Reddy Arun Kumar S Sreeram V Maroti Anupam Awasthi	National Conference on Emerging Trends, challenges in Transformer Design, Testing & Maintenance, held at Hotel Noor Us Sabah Palace, Bhopal, on 3rd & 4th February, 2016
Instrumentation Division			
67	Design, Development and Fabrication of High Voltage/ High Frequency Static Discharge Device	Sudha. S	2nd International Conference on High Voltage Engineering & Technology (NCHVET 2017), held at CPRI, Bangalore, on 27th & 28th January 2017
68	Significance of Calibration of Reference Sub Standard energy meter and its maintenance		"9th International Conference on Advances in Metrology" organised by CSIR –NPL, heldat New Delhi, from 24th to 26th February 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
69	Unconventional and Optimized Measurement of Solar Irradiance in Bangalore using Photovoltaic Techniques	Shruthi K.J. Sr. Research Fellow	ICTACT Journal of Micro Electronics (IJME), in Bengaluru, July 2016
70	Anomalies in Practical Solar Photovoltaic Installations and Tilt Angle Optimization		IEEE PEDES Conference, held in Trivandrum, from14th to 17th December 2016
71	Investigating effects of Shading on Solar Conversion Devices		1st Springer International Conference on ETAEERE 2016 held in Majhitar, Sikkim, Sikkim Manipal Institute of Technology (SMIT), on17th & 18th December 2016
	Insulation Division		
72	Condition Assessment of High Voltage Isolators by Thermal method used in High Voltage Substation	Dr.C.Viswanatha Rakesh K G	"4th International Conference on Advances in Applied Science and Environmental Technology (ASET)", held at Bangkok, Thailand, on 7th & 8th May 2016
73	Study on extension of silicone rubber insulator lifetime under accelerated ageing conditions using silicone sealent	Ashitha P N S Ganga	2nd National Conference on High Voltage Engineering & Technology, (NCHVET 2017), held at CPRI, Bangalore, on 27th & 28th January 2017
74	Remaining Life Estimation of Overhead Composite Insulator using Particle Swarm Optimization Technique	Ashitha P N S Ganga	International Conference on Power and Embedded Drive Control (ICPEDC 2017), held at SSN College of Engineering, Chennai, from 16th to 18th March 2017

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
75	UV Accelerated Ageing Studies on EVA-PV Module	Lahari N V S Ganga Dr. Moumita Naskar	Third International Conference on Science Technology Engineering & Management (ICONSTEM-2017, IEEE), held at Jeppiar Engineering College, Chennai, on 23rd & 24th March 2017
76	Effect of vinyl acetate content on the electrical behavior and activation energy of EVA encapsulants	Dr. Moumita Naskar S Ganga Lahari N V	
Mechanical Engineering Division			
77	Overhead Transmission line Conductors and Accessories" An Overview"	Praful R. Dongre	Seminar on Design and Testing and Transmission line conductors and Accessories (DTTCA-17), held at CPRI, Bangalore, on 20th January 2017
78	Performance Evaluation of 800kV HVDC Assembly Insulator String and Associated Hardware	M.D.Ananthababu	
79	Testing of EHV Transmission Line Poles at CPRI- An Overview	D. Revanna Dr. M. Sevlaraj K. Vijayakumar B.M. Varadharaju	
80	Cantilever test on Insulator"- 'A Review'	Praful R. Dongre	
Materials Technology Division			
81	Preparation and characterization of Electroless Ni-P-W coated Nano Cenospheres ABS composite for EMI Shielding Application	S. Vynatheya, Naveen Kumar J R Madhusudana R V. Bheema Raju L. Chandra Sagar	IC Nano 2016 International Conference organized by VTU, Belgaum, held at Muddena Halli, Chikkaballapur, from 21st to 23rd April 2016
82	Modification of Power Plant Condenser by Heat Pipes	T. Mallikharjuna Rao	International Conference on "Global Energy Technological Summit 2016", organized by M/s. NTPC, from 7th to 9th November 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
83	Magnetic ageing characteristics of CRGO electrical steels	G. Kishore Kumar	National Conference on Emerging Trends, challenges in Transformer Design, Testing & Maintenance, held at Noor Us Sabah Palace Hotel, Bhopal, on 3rd & 4th February 2017
84	Influence of MgO on Electrochemical performance of Nickel chloride in alkaline aqueous electrolyte	B Shruthi B.J. Madhu V. Bheema Raju S. Vynatheya B. Veena Devi	Journal of New Materials of Electrochemical Synthesis, 2016, Vol. No.19, Issue No.3, pp 131-137
85	Processing of Electroless NI-P-W Coated Nanocenosphere/ Polymer Composite for EMI Shielding Application	Vynatheya S Chandra Sagar L Bheema Raju V	International Journal of Current Research, Vol. 9, Issue 01, pp.45672-45677, January 2017
86	Electroless Co-P Coated Nanocenosphere/ Polymer/Filler Composite for EMI Shielding Effectiveness	Vynatheya S Raksha G Madhusudhana R Chandra Sagar L Bheema Raju V	International Journal of Development Research, Vol. 07, Issue 01, pp. 10935-10941, January 2017
87	Preparation and Characterization of Electroless Ni-P-W Coated NanoCenosphere/ABS composite for EMI Shielding application	S.Vynatheya J R Naveenkumar V. Bheema Raju L.Chandra Sagar Madhusudana	International Journal of Current Research, Vol.9, Issue 01, pp. 45672-45677, January 2017
88	Solid Particle Erosion of HVOF Sprayed Coatings at Higher Temperature	Raghavendra Naik R K Kumar Saravanan V Dr. Shekhar Kumar M	The Journal of CPRI, Volume No. 12, Issue No. 2, pp. 351-362– June 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
89	Fire retardancy Characteristics & Mechanical Properties of High density polyethylene/ Ultrafine Fly Ash/ MWCNT Nano Composites	V. C. Divya M. Ameen Khan Dr. B. Nageswar Rao R R N Shailaja S. Vynatheya Dr. S. Seetharamu	Journal of Polymer Plastics Technology and Engineering, Vol. No.56, Issue No.7, 2017, pp 762-776
90	Quantitative Estimation of Mullite in Alumina based porcelain insulators	Vynatheya S Suryanarayana K Dr. Shekhar Kumar M Santhosh Kumar B L Bheema Raju V	The Journal of CPRI, Volume No. 12, Issue No. 2 pp.371-380, June 2016
91	Microwave sintering: An energy efficient process for sintering aluminum metal powder	Dr. M. G Ananda Kumar Jagannath Nayak	The Journal of CPRI, Volume No. 12, Issue No. 2 pp.381-394, June 2016
92	A study on the mechanical behavior of microwave sintered aluminium cenospheres based syntactic foams	Dr. M.G Ananda Kumar Nataraj J R Dr. S. Seetharamu Jagannath Nayak	The Journal of CPRI, Volume No. 12, Issue No. 2 pp.395-408, June 2016
93	Failure analysis of high strength T91 boiler tubes used in thermal power plant: A case study	Arvind Kumar Malabika Roy Janardhana M Dr. Shekhar Kumar M	The Journal of CPRI, Volume No. 12, Issue No. 2 pp.363-370, June 2016
94	Numerical prediction of erosion in coal burner of 210 MW boiler through computational fluid dynamic modeling	R K Kumar Raghavendra Naik Dr. Saravanan V Janardhana M	The Journal of CPRI, Volume-12, Issue No. 2.pp.325-334 – June 2016
95	Root cause analysis of failure of 40th stage moving blade of single cylinder condensing turbine	R K Kumar Janardhana M Bhaskar Sharma K V	The Journal of CPRI, Volume No. 12, Issue No. 2,pp.335-350 – June 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
96	Structural and Mechanical Characterization of Service Exposed 2.25Cr–1Mo Steel	Hari Krishan Yadav Lakshmiprasad Maddi A. R. Ballal D. R. Peshwe Dr. M. Venkateswara Rao	Published in Journal of Transactions of Indian Institute of Materials, online 27th May 2016
97	CFD Modeling of blended Coal combustion in a typical 210 MW Indian Boiler	Arun Kumar K H Dr. Saravanan V Kumar R K Dr. Shekar Kumar M	The Journal of CPRI, Vol. No.12, Issue No.3, pp. 625-636, September 2016
98	Condition Assessment of Generator rotor shaft of 108 MW hydro plant through phased Array Ultrasonic technique and estimation of remaining life through Finite Element Analysis	Kumar R K Janardhana M Venkatesh T R Dr. Shekar Kumar M Arun Kumar K H	The Journal of CPRI, Vol.12 No.3 pp.613-624, September 2016
99	High Temperature erosion resistance characteristics of boiler tube materials of thermal power plant	Kumar R K Raghavendra Naik Janardhana M Kiran B	The Journal of CPRI, Vol. No.12 Issue No.3, pp.603-612 September 2016
100	Characteristics of different Indonesian Coals blended with a high ash Indian Coal	Arun Kumar K H Dr. Saravanan V Dr. Shekar Kumar M	The Journal of CPRI, Vol. no. 12, Issue 3, September 2016 page no.579-590
101	A study on the slagging and fouling propensity of imported coals blended with Indian Coal	Dr. Ananda Kumar M.G Dr. Saravanan V	The Journal of CPRI, Vol. no. 12, Issue 3, September 2016 page no.591-602
102	High temperature erosion behavior of weld overlay hard coating	Raghavendra Naik K R. K. Kumar Dr. V. Saravanan, Dr. P. Sampath Kumar Dr. S. Seetharamu	National Tribology Conference NTC2016-561, held at IIT, BHU Varanasi, from 8th to 10th November 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
103	Silt Erosion performance of HVOF Processed Tungsten Carbide Coatings	T.Pramod R. K. Kumar P. Sampath Kumaran S. Seetharamu P. T. Bindagi	National Tribology Conference NTC 2016-529, held at IIT, BHU, Varanasi, on 8th to 10th November 2016
104	Importance and process of RLA studies in assessment of need for R&M – a case study	Dr. M. Venkateswara Rao T. Mallikharjuna Rao	National Workshop on "Renovation, Modernization, Uprating & Life Extension of Hydro Power Plant – Diverse Issues & Handling Strategies" organized by M/s. Central Electricity Authority, New Delhi, on 16th December 2016
105	Rectification & Strengthening of old penstocks of Hydroelectric Power Plant to extend the life through RLA studies	Dr. M. Venkateswara Rao S. Vynatheya	CEA Publication on R&M works of Hydro Electric Power Plants by CEA during December 2016
106	Condition Assessment of Generator Shaft of 108 MW Hydro Plant through phased array ultrasonic technique and estimation of remaining life through finite element analysis	R.K.Kumar M.Janardhana	
107	Synthesis, Spectroscopic analysis and Electrochemical performance of modified ß-nickel hydroxide electrode with CuO	B. Shruthi B. J. Madhu V. Bheema Raju S. Vynatheya B. Veena Devi Jayashree C.R. Ravikumar	Journal of Science: Advanced Materials and Devices, Vol. No.2, Issue No.1, March 2017, pp.93-98

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
108	Optical 3D Laser scan for Penstock Corrosion damage Assessment for hydropower Plant	G.Kishore Kumar M.Janardhana	26th National Seminar on Non-Destructive Evaluation-NDE-2016, Organized by Indian Society for Non-destructive Testing. Thiruvanathapuram, from 15th to 17th December 2016
109	Root cause failure analysis investigations of 400kV compression type dead end clamp connectors –A case study	R K Kumar Arvind Kumar	National Seminar on Design & Testing of Transmission Line Components & Accessories (DTTCA-2017), held at CPRI, Bangalore, on 20th January 2017
	Power System Division		
110	Zone-2 Setting of Distance Relays using User Defined Time-Inverse Over Current Relay Characteristics	Dr. Manohar Singh	IEEE PES Transmission & Distribution Conference & Exposition, held at Dallas, USA, from 2nd to 5th May, 2016
111	Improved Phase Lock Loop system under Distorted Conditions of Grid connected renewable energy Sources	S. A. Lakshmanan Dr. Amit Jain Dr. B. S. Rajpurohit	IEEE PES General Meeting 2016 (IEEE PESGM 2016), held at Boston, from 17th to 21st July, 2016
112	Neutral Grounding Reactors for Shunt Compensated EHV Transmission Lines	Meera K.S Puneet Bhurat	TENCON Conference, held at Singapore, from 22nd to 25th November 2016
113	Grid Stability with large Wind Power Integration-A Case Study	J. Sreedevi Meera K. S. Noorchesma	
114	A Hybrid State Estimator using current based Estimator and PMU measurements	Noopura S P Dr. Jayan M V	International Conference on Power Engineering Computing and Control (PECCON- 2017), held at VIT Chennai, from 2nd to 4th March 2017

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
115	Coordination of Electro-mechanical Based overcurrent Relays using CMA-ES algorithm	Dr. Manohar Singh	7th IEEE Power India International Conference, held at Bikaner, Rajasthan, from 25th to 27th November, 2016
116	An approach to Internet of Things Network Deployment for Smart Grid Applications	Farooque Khan Dr. Amit Jain	IEEE International Conference on Wireless Communications, Signal Processing and Networking WISPNET-2017, held at Chennai, from 22nd to 24th March 2017
117	Reliability analysis in power distribution system	P. Chandhra Sekhar R. A. Deshpande V. Sankar	National Conference on Challenges & Issues in operation of Competitive Electricity Markets, held at CPRI, Bangalore, on 8th & 9th December 2016
118	Evaluation and Improvement of Reliability Indices of Electrical Power Distribution System	P. Chandhra Sekhar R. A. Deshpande V. Sankar	NPSC 2016, held at IIT, Bhubaneswar, from 19th to 21st December 2016
119	Incorporation of Asynchronous Generators as PQ Model in Load Flow Analysis for Power Systems with Wind Generation	James Ranjith Kumar R. Dr. Amit Jain	
120	A Study on Grid Connected PV System	J. Sreedevi Ashwin Nainiraju	
121	Voltage Current based Time Inverse Relay Co-ordination for PV feed distribution systems	Anubha Agrawal Dr. Manohar Singh, Tejeswini M V	

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
122	Network Reduction of Power System for Transient stability studies	Ashwin N J Sreedevi Pradipkumar Dixit	National Conference on Challenges and Issues in operation of competitive electricity markets, held at CPRI, Bangalore, on 8th & 9th December 2016
123	Demand Response for Smart Grid: A Review	Hemanth Singhabhattu Dr. Amit Jain Dr. Tulika Bhattacharjee	2nd National Conference on High Voltage Engineering & Technology (NCHVET- 2017) held at CPRI Bangalore, on 27th to 28th January, 2017.
124	Sympathetic Trippings Blocking in Overcurrent Relay Coordination Algorithm during Steady State & Transient Network Topologies	Dr. Manohar Singh Dr. B. K. Pani Grahi Vishnuvardhan	International Journal of Emerging Electric Power Systems, Vol.17, Issue No.3, June 2016
125	Adaptive protection coordination scheme for power networks under penetration of distributed energy resources	Dr. Manohar Singh Telukunta Vishnuvardhan Dr. S.G. Srivani	IET, Generation, Transmission & Distribution Journal, Volume 10, Issue No.15, 17th November 2016, pp. 3919 – 3929
126	Active Power Control of VSC-HVDC system	Nainiraju J Sreedevi Meera K S Dr. Rajashekhar P Mandi	Asian Journal of Engineering and Technology Innovation, Special Conference, Vol. 2016, Issue No.3
127	Need for Real Time Simulation in cyber security Applications	J Sreedevi P Noorcheshma Ashwin N K.S.Meera	The Journal of CPRI, Vol.12 Issue No.4, December 2016, pp.731-736

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
128	Dynamic Simulation of EAF on RTDS for Compensation Sizing	Meera K. S.	Journal of The Institution of Engineers (India): Series B, 98(1), 137-146, DOI 10.1007/s40031-016-0219-7 Published online: 15th June 2016
129	Independent control of multi-terminal voltage source converter based HVDC link analyzing for dc faults	S.K.B. Karishma P. Noor Cheshma J. Sreedevi	Innovative Journal of Engineering & Technology, Vol. 4, Issue 4, October to December 2016, PP 1-13
	Research & Development Division		
130	Assessment of Paper-oil Insulation under Copper Corrosion using Polarization and Depolarization Current Measurements	S. Daisy Flora Dr. J. Sundara Rajan	IEEE Transactions on Dielectrics and Electrical Insulation, Vol. 23, No. 3, pp.1523-1533, 2016
131	Comparative study of dielectric and mechanical properties of HDPE-MWCNT-SiO2 nanocomposites	Praveen T. A. Dr. J. Sundara Rajan R. R. N. Sailaja	Materials Research Bulletin 83, Elsevier (2016): pp.294-301
132	Evaluation of thermal and flame properties of HDPE-MWCNT-SiO2 nanocomposites	Praveen T. A. Dr. J. Sundara Rajan R. R. N. Sailaja	Composite Interfaces 24.2 (2016): pp.215-232, Publisher: Taylor & Francis
133	Investigations on Copper Sulfide Diffusion into Paper Insulation of Transformers	Dr. J. Sundara Rajan S. Daisy Flora C. Ranganathaiah	IEEE Transactions on Dielectrics and Electrical Insulation, Vol. 23, Issue 4, pp. 2421-2429, August 2016

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
134	Hybrid Transient Stability Analysis of Power Systems having large penetration of Doubly Fed Induction Generator Based Wind Energy Conversion System	Chaitra T.M.S. Dr.Tulika Bhattacharjee	National Conference on Challenges and Issues in Operation of Competitive Electricity Markets" (CIOCEM-2016), held at CPRI, Bangalore, on 8th & 9th December 2016
Regional Testing Laboratory-NOIDA			
135	Design of Solar Photovoltaic Energy Generation System for Off-Grid Applications	Dr. Neha Adhikari	International Conference on New and Renewable Energy Resources for Sustainable Future (ICONRER-2017), held at Jaipur, from 2nd to 4th , February 2017
136	International Specifications of Liquid Dielectrics under use in Power Equipment with a special focus on very high voltage transmission systems and high ambient temperature based tropical countries	G. R. Viswanath	IOCL Power Meet, held at Ka[us]hambi, Ghaziabad, on 23rd September 2016
137	Furan analysis and degree of Polymerization as a Diagnostic tool to determine life of solid insulation	G.R.Viswanath	National Conference on Emerging trends & challenges in Transformer Design, Testing & Maintenance, held at Hotel Noor Us-Sabah, Palace, Bhopal, on 3rd & 4th February 2017

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
		Short Circuit Division	
138	Thermal Performance of Distribution Transformers: Factors of Influence during Temperature Rise Test	S. Arjuna Rao N. Manikandan G. Girija Swaraj Kumar Das	Published in the Electrical India Magazine, June 2016 Edition, page nos. 46 – 54
139	Short-circuit withstand Strength Tests on LV assemblies as per IEC 61439 – Failure Analysis and Interpretations	N. Maheshwara Rao B. R. Vasudevamurthy Swaraj Kumar Das R. A. Deshpande	Two day Seminar on "Emerging Trends in Switchgear Technology and Testing Requirements of LT & HT Switchgear Controlgear, held at CPRI, Bangalore, on 8th & 9th December 2016
140	Methodology of Temperature-rise Tests on LV assemblies as per IEC 61439	N. Maheshwara Rao B. R. Vasudevamurthy Swaraj Kumar Das R. A. Deshpande	
141	Temperature Rise Test on Transformers – Thoughtful Interpretations and Novel Understandings	G. Girija N. Maheshwara Rao S. Arjuna Rao B. R. Vasudevamurthy Swaraj Kumar Das R. A. Deshpande	Two day National Conference on "Emerging Trends, Challenges in Transformer Design, Testing & Maintenance", held at Hotel Noor-Us-Sabah, Bhopal, organised by CPRI- STDS, Bhopal, on 3rd & 4th February 2017
		Switchgear Testing & Development Station- Bhopal	
142	Critical issue during short circuit withstand capability test of power Transformers	J. Santhosh M.K. Wadhwani D. K. Grover M. S. Takkher Yugal Agrawal	National Conference on emerging trends & challenges in Transformer Design, Testing & Maintenance, held at Hotel Noor Us-Sabah, Palace, Bhopal, on 3rd & 4th February 2017
143	Analysis of the failure modes of the Distribution Transformer during short circuit testing- A CPRI Experience	Prabhakaran	

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Sl. No.	Title of the paper	Author/s Shri/Smt./Kum.	Presented/Published in Seminar/ Journal (Vol & pp.)/Venue/ Date
144	Performance Evaluation of Distribution Network – Power Quality Approach	Surendra P Kalambe	The Journal of CPRI, Volume-12, Issue No. 3, September 2016, pp 473-480
Utility Automation Research Centre			
145	Cyber Security for Smart Grid Communication: Threats and Challenges in Smart City	Shaileshwari M.U.	Published in the International Conference on Development of Smart Cities: Interface, Governance and Technology, held at Dr. Ambedkar Institute of Technology, Bangalore, on 9th & 10th September 2016
146	"Software Defined Networking for Smart Grid Communications and Security Challenges"	M U Shaileshwari	International Conference & Exhibition on Smart Grids, Cyber Security in India Smart Grid Week-2017, held at Manekshaw Center, Dhaula Kuan, New Delhi, organized by ISGF, from 8th to 10th March 2017
Ultra High Voltage Research Laboratory, Hyderabad			
147	Laboratory studies on the effects of atmospheric temperatures on corona generated ionic current of HVDC Transmission lines	K. Chaitanya Sai Prameela K. A. Aravind Dr.Pradeep M Nirgude	2nd National Conference on 'High Voltage Engineering and Technology (NCHVET-2017), held at CPRI, Bangalore, on 27th & 28th January 2017.
148	Investigation of field aged composite insulators	B. Sravanthi B. Yashodara K. A. Aravind Dr.Pradeep M Nirgude	
149	Influence of ambient atmospheric conditions and environmental pollution on RIV of 220kV, composite insulator	B. Madhava Rao Prameela P. Rajamani Dr. Pradeep M Nirgude	

RAO & EMMAR
CHARTERED ACCOUNTANTS

INDEPENDENT AUDITOR'S REPORT

To,
The Governing Council
Central Power Research Institute
Bangalore.

Report on the Financial Statements

We have audited the accompanying financial statements of **CENTRAL POWER RESEARCH INSTITUTE** ("the Institute"), which comprise the Balance Sheet as at March 31, 2017, the Income and Expenditure Account for the year then ended, and the Receipts and Payments Statement of the Institute for the year thereto and a summary of significant accounting policies and other explanatory information.

Management's Responsibility for the Financial Statements

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

Auditor's Responsibility.

Our responsibility is to express an opinion on these financial statements based on our audit. We have conducted our audit in accordance with the standards on auditing issued by the Institute of Chartered Accountants of India. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain

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

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

Opinion

In our opinion and to the best of our information and according to the explanations given to us, except for the possible effects of the matter described in the Basis for Qualified Opinion and the matters described in the emphasis of matter paragraph, the aforesaid financial statements give the information in a true and fair manner in conformity with the accounting principles generally accepted in India

a) In the case of the Balance Sheet, of the state of affairs of the Institute as at 31/03/2017; and
b) In the case of the Income and Expenditure Account, of the excess of income over expenditure for the year ended as on that date; and
c) In the case of the Receipts and Payments Statement, of the cash flows for the year ended as on that date.

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Basis for Qualified Opinion:

a. The balances of advance received from clients of Rs. 50.17 crores is subject to confirmation. The effect of the same, if any, on the surplus during the year and debtors and/or deposits could not be ascertained.

b. Sundry Debtors amounting to Rs.35.71 crores is subject to confirmation.

c. An amount of Rs. 99.60 lakhs receivable grouped in Schedule 8 under 'Other Claims Receivable' is long outstanding (from FY 2007-08) and is doubtful of recovery. No provision has been made towards the same. Accordingly, the surplus for the year as well as the balance of Reserves and Surplus would have reduced by the said amount had the provision been made.

d. An Amount of Rs.657 Lakhs is shown as unknown remittance received pending reconciliation. The same is subject to be reconciled with debtors recovered or advance made by debtors.

Emphasis of Matter Paragraph

a. As expressed in Note 4 of Schedule 16, Inventories are valued at Cost and cost includes Expenses incurred for procuring the same which are directly Attributable, but all the consumables Stores, Spares are directly charged off and there was no Effective Inventory Management for Consumable Items.

b. As expressed in Note 12 of Schedule 17, In case of Short term & long term Investments which are maintained in Dematerialized Form (Investments made in public Sector undertakings) Interest Certificates were not provided to us. (Absence of External Confirmation), closing balance of Accrued interest on such Investments were calculated based on Simple interest method.

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c. Physical verification of Fixed Assets was not conducted during the year and Fixed Assets registers are not being updated as and when the assets are procured but it was being done only at the end of the Accounting year.

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

B J Praveen
Partner
Membership No.: 215713.
Date: 31st May 2017
Place: Bengaluru.

CENTRAL POWER RESEARCH INSTITUE, BANGALORE.

BALANCE SHEET AS AT 31ST MARCH 2017

(Amount in ₹)

Capital Fund and Liabilities	Schedule	Current Year	Previous Year
Capital Reserve representing Assets acquired from Grant-in-Aid from Government of India and Others	1	866,99,93,534	779,73,72,201
Reserves and Surplus	2	45,44,33,645	42,13,86,728
Earmarked and Endowment Funds	3	568,34,49,603	495,32,30,204
Grants from Government of India	4	82,19,74,566	111,37,90,863
Current Liabilities and Provisions	5	86,44,20,098	63,51,10,958
TOTAL		**1649,42,71,446**	**1492,08,90,954**
Assets			
Fixed Assets (Gross Block)	6	831,08,60,925	750,32,39,592
Less: Depreciation provided	15	205,19,73,790	186,05,77,859
Fixed Assets (Net Block)	6	625,88,87,135	564,26,61,733
Investments from Earmarked & Endowment Funds	7	512,95,24,701	474,73,96,908
Current Assets, Loans and Advances	8	510,58,59,610	453,08,32,313
TOTAL		**1649,42,71,446**	**1492,08,90,954**
Significant Accounting Policies	16		
Notes on Accounts & Contingent Liability	17		

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

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

Bangalore
31-05-2017

(N R Padmanabha)
Chief Accounts Officer

(V.S. Nandakumar)
Director General

(B.J. Praveen)
Partner
Membership No. 215713

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE

INCOME AND EXPENDITURE ACCOUNT FOR THE YEAR ENDED 31ST MARCH 2017

(Amount in ₹)

INCOME	Schedule	Current Year	Previous Year
Income from Test Fee & Consultancy	9	161,47,83,055	139,04,50,866
Fees	10	2,12,79,589	2,71,47,989
Interest Earned	11	19,49,41,608	16,38,14,043
Other Income	12	74,90,326	1,05,69,607
TOTAL (A)		**183,84,94,578**	**159,19,82,505**
EXPENDITURE			
Research Establishment Expenses	13	110,40,71,610	71,11,03,210
Research Administrative Expenses	14	40,52,57,762	33,25,94,533
Depreciation	15	19,13,95,931	29,86,58,691
TOTAL (B)		**170,07,25,303**	**134,23,56,434**
Balance being excess of Income over Expenditure (A-B)		13,77,69,275	2496,26,071
BALANCE BEING SURPLUS CARRIED TO GENERAL RESERVE		**13,77,69,275**	**2496,26,071**
Significant Accounting Policies	16		
Notes on Accounts & Contingent Liability	17		

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

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

Bangalore
31-05-2017

(N R Padmanabha)
Chief Accounts Officer

(V.S. Nandakumar)
Director General

(B.J Praveen)
Partner
Membership No. 215713

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

	SCHEDULE - 1	Current Year		Previous Year	
	CAPITAL RESERVE REPRESENTING ASSETS ACQUIRED FROM GRANT-IN-AID FROM GOVT. OF INDIA AND OTHERS				
a)	Under Plan Capital (Grant) (For Fixed Asset)	686,51,79,371		668,60,09,124	
	Addition during the year	75,06,92,666	761,58,72,037	17,91,70,247	686,51,79,371
b)	Under Plan Capital (Grant) (For M/s NHPTL Equity Capital)	2390,00,000		23,90,00,000	
	Addition during the year	10,00,000	2400,00,000		2390,00,000
c)	Under Plan Capital (CPRI's 10% Contributioin.)	71,03,651		-	
	Addition during the year	-	71,03,651	71,03,651	71,03,651
d)	Under R&D Plan	28,18,06,845		27,98,41,573	
	Addition during the year	1,00,02,915	29,18,09,760	19,65,272	28,18,06,845
e)	Under Non-Plan	10,89,60,792		7,30,54,503	
	Addition during the year	3,71,87,065	14,61,47,857	3,59,06,289	10,89,60,792
f)	Under Non Plan (Equity Investment)				
	Addition during the year	6,40,00,000	6,40,00,000		-
g)	Assets Acquired out of General Researve	6,30,00,266		6,00,58,299	
	Addition during the year	5,47,745	6,35,48,011	29,41,967	6,30,00,266
h)	Assets Acquired out of Sponsored Schemes	17,50,04,383		14,84,76,427	
	Addition during the year	91,90,942	18,41,95,325	2,65,27,956	17,50,04,383
i)	Assets Acquired out of RSoP & NPP Management Fund	24,04,110		24,04,110	
	Addition during the year	-	24,04,110	-	24,04,110
j)	Capitalisation of Assets acquired out of Loan	4,95,00,000		4,95,00,000	
	Addition during the year	-	4,95,00,000	-	4,95,00,000
k)	Surplus on sale of Asset	54,12,783		54,12,783	
	Addition during the year	-	54,12,783	-	54,12,783
	TOTAL		**866,99,93,534**		**779,73,72,201**

Place : Bangalore,
Date 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

	SCHEDULE 2	Current Year		Previous Year	
	RESERVES AND SURPLUS				
A	**GENERAL RESERVE**				
	As per last Account	1,33,28,482		14,25,50,667	
	Add: Surplus during the year	13,77,69,275		24,96,26,071	
	Less: Transfer to 'Reserve for Capital Expenditure' out of o.b.	-		14,00,00,000	
	Less: Transfer to 'Reserve for Capital Expenditure' during financial year	3,50,00,000		20,00,00,000	
	Less: Assets directly acquired out of General Reserve	5,47,745		29,41,967	
	Less: Investment in Equity Capital of M/s NHPTL	6,40,00,000		-	
	Less: Assets acquired transferred to Capital Reserve	3,71,87,065		3,59,06,289	
	Net Balance A		**1,43,62,947**		**1,33,28,482**
B	**Reserve for Capital Expenditure out of CPRI generated funds**				
	Opening Balance	33,28,96,349		-	
	Add: Transfer from General Reserve out of o.b.	-		14,00,00,000	
	Add: Contribution during the year	3,50,00,000		20,00,00,000	
	Less: Utilisation during the year	-		71,03,651	
	Net Balance B		**36,78,96,349**		**33,28,96,349**
C	**MAINTENANCE, RENEWAL & OBSOLESCENCE RESERVE**				
	Opening Balance	7,51,61,897		7,29,64,699	
	Add: Interest earned & accrued during the year	57,39,220		35,27,108	
	Add: Balances under Security Deposit etc.,	4,62,373			
	Less: Utilisation during the year	91,89,141		13,29,910	
	Net Balance C		**7,21,74,349**		**7,51,61,897**
	TOTAL (A+B+C)		**45,44,33,645**		**42,13,86,728**

Rao & Emmar Chartered Accountants BANGALORE

Place : Bangalore,
Date: 31-05-2017.

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

	SCHEDULE 3:	Current Year		Previous Year	
	EARMARKED & ENDOWMENT FUNDS:				
A	**SUPERANNUATION FUND**				
	Opening Balance	459,16,50,461		421,26,47,429	
	Add: Receipts from other organisations	2,35,764		-	
	Add: Contribution during the year	55,39,24,902		20,58,33,296	
	Add: Interest received and accrued	37,41,54,945		35,54,30,019	
	Less: Utilisation for Pension payments	24,00,14,035		18,22,60,283	
	Sub Total	**527,99,52,037**		**459,16,50,461**	
	Add: Balances under Security Deposit etc.,	93,57,280		18,13,105	
	Net Balance - A		**528,93,09,317**		**459,34,63,566**
B	**PROVIDENT FUND**				
	Opening Balance	33,83,52,338		31,05,93,717	
	Add: Subscriptions & Repayments	6,98,12,662		6,17,66,348	
	Add: Interest Paid / Credited to PF subscribers	2,69,01,575		2,32,60,583	
	Less: Withdrawals (Principal + Interest)	6,64,57,181		5,72,68,310	
	Sub Total	**36,86,09,394**		**33,83,52,338**	
	Add: Balances under Security Deposit etc.,	958		958	
	Opening Balance (Additional Interest)	2,11,95,859		1,48,37,000	
	Add: Additional Interest earned (Excess of Interest earned over interest paid) (Rs.3,09,95,917 - 2,89,01,575)	40,94,342		63,58,859	
	Total	2,52,90,201		2,11,95,859	
	Net Balance - B		**39,39,00,553**		**35,95,49,155**
C	**NEW PENSION SCHEME FUND**				
	(i) Accumulated Opening Balance (Employee's Contribution)	21,137		21,137	
	Add: Subscriptions/Employees' Contribution	3,783		-	
	Add: Interest on Employees' Contribution (cumulative)	8,492		5,828	
	(ii) Accummlated Opening Balance (Employer's Contribution)	21,136		21,136	
	Add: Employer's Contribution	3,783		-	
	Add: Interest on Employer's Contribution (cumulative)	8,492		5,828	
	Sub Total	66,823		53,929	
	Add: Accummulated Interest earned	1,56,128		1,46,772	
	Add: Balances under Security Deposit	16,782		16,782	
	Net Balance - C		**2,39,733**		**2,17,483**
	TOTAL (A+B+C)		**568,34,49,603**		**495,32,30,204**

Place : Bangalore,
Date : 31-05-2017.

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

		SCHEDULE 4	Current Year		Previous Year	
		GRANTS FROM GOVT. OF INDIA, & OTHERS				
A		Under Plan Capital				
		Opening Balance	96,85,31,590		88,95,01,837	
		Add: Grant received during the year	47,04,00,000		25,82,00,000	
		Less: Grant utilised during the year	75,16,92,666		17,91,70,247	
		Grant Balance		68,72,38,924		96,85,31,590
B		Under R&D Plan				
		Opening Balance	8,30,20,273		1,83,06,145	
		Add: Grant received during the year	4,58,50,000		6,87,67,000	
		Less: Grant utilised during the year	1,83,16,586		40,52,872	
		Grant Balance		11,05,53,687		8,30,20,273
C		Under RSoP Scheme				
		Opening Balance	4,58,30,000		6,52,946	
		Add: Grant received during the year	1,48,56,000		4,58,30,000	
		Less: Grant utilised during the year	5,64,49,045		6,52,946	
		Grant Balance		42,36,955		4,58,30,000
D		Under NPP Scheme				
		Opening Balance	1,64,09,000		1,79,09,000	
		Add: Grant received during the year	12,67,94,000		-	
		Less: Grant utilised during the year	12,32,58,000		15,00,000	
		Grant Balance		1,99,45,000		1,64,09,000
		TOTAL		**82,19,74,566**		**111,37,90,863**

Place : Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

		SCHEDULE 5	Current Year		Previous Year	
		CURRENT LIABILITIES AND PROVISIONS				
A		**CURRENT LIABILITIES**				
	1	**Sundry Creditors**				
		a) For Supplies & Services	58,87,164		71,79,240	
		b) For Expenses	3,29,75,370		2,87,18,444	
		c) For Salaries	5,92,78,466		3,64,71,370	
		d) For Others	1,99,46,725		1,07,90,654	
		e) Interest received on Grant Account to be refunded to M o P	2,03,38,475		3,76,50,985	
				13,84,26,200		12,08,10,693
	2	**Deposits Received**		50,17,20,385		37,22,17,299
	3	**Statutory Liabilities**		94,39,279		64,48,943
	4	**EMD, Security Deposits and others**		8,17,65,292		8,33,16,159
	5	**Sponsored Scheme Deposits**		7,02,08,069		5,23,17,864
	6	**Reserve for Doubtful debts**		6,28,60,873		-
		TOTAL		**86,44,20,098**		**63,51,10,958**

Place: Bangalore,

Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

	SCHEDULE 6	GROSS BLOCK				
	FIXED ASSETS	Cost/valuation As at beginning of the year	Additons during the year	Transfer from WIP	As at the Current year end	As at the Previous year end
A	FIXED ASSETS:					
1	LAND:					
	Freehold	6,96,84,860	-	-	6,96,84,860	6,96,84,860
2	BUILDINGS ON FREEHOLD LAND	88,25,09,684	2,07,74,545	6,35,86,935	96,68,71,164	88,25,09,684
3	PLANT MACHINERY & EQUIPMENT	578,79,76,872	2,45,14,643	25,82,09,060	607,07,00,575	578,79,76,872
4	VEHICLES	51,40,342	-	-	51,40,342	51,40,342
5	FURNITURE, FIXTURES	2,30,72,328	19,99,169	62,611	2,51,34,108	2,30,72,328
6	LIBRARY BOOKS & FILM	1,45,90,203	4,49,368	-	1,50,39,571	1,45,90,203
7	MACHNERY & EQUIPMENTS (SPONSERED PROJECTS)	17,50,04,383	91,90,942	-	18,41,95,325	17,50,04,383
	TOTAL	**695,79,78,672**	**5,69,28,667**	**32,18,58,606**	**733,67,65,945**	**695,79,78,672**
B	CAPITAL WORK-IN-PROGRESS	53,81,57,269	75,06,92,666	(3218,58,606)	96,69,91,329	53,81,57,269
	CAPITAL WORK-IN-PROGRESS (CPRI GRANT PORTION)	71,03,651	-	-	71,03,651	71,03,651
	LESS: DEPRECIATION provided upto 31-03-2016	186,05,77,859	19,13,95,931	-	205,19,73,790	186,05,77,859
	GRAND TOTAL	**564,26,61,733**			**625,88,87,135**	**564,26,61,733**

Place : Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

	SCHEDULE 7	Current Year	Previous Year
	INVESTMENTS FROM EARMARKED/ENDOWMENT FUNDS		
A	**SUPERANNUATION FUND INVESTMENT ACCOUNT**		
	1 In Government Securities	-	3,10,58,749
	2 LIC of India, under Superannuation Scheme	469,28,80,132	175,50,00,000
	3 Bonds	-	155,75,00,000
	4 Term Deposits with Banks & Financial Institutions	-	83,95,00,000
	5 Interest Accrued on Superannuation Fund Investments	1,89,80,462	16,79,16,727
	6 TDS Receivables	2,24,87,364	2,23,60,900
	7 Cash at Bank (S.B. Account No.10356553751)	10,36,457	1,42,93,894
	Total - A	**473,53,84,415**	**438,76,30,270**
B	**PROVIDENT FUND INVESTMENT ACCOUNT**		
	1 In Government Securities	54,34,189	54,34,189
	2 Bonds	4,50,00,000	27,00,00,000
	3 Term Deposits with Banks & Financial Institutions	30,00,00,000	5,55,00,000
	4 Interest Accrued on Provident Fund Investments	2,04,59,528	1,25,06,572
	5 TDS Receivables	17,08,032	16,68,445
	6 Cash at Bank (S.B. Account No.10356553740)	2,12,98,804	1,44,39,949
	Total - B	**39,39,00,553**	**35,95,49,155**
C	**NEW PENSION SCHEME FUND INVESTMENT ACCOUNT**		
	1 Cash at Bank (S.B. Account No.30019323462)	2,39,733	2,17,483
	Total - C	**2,39,733**	**2,17,483**
	Total (A+B+C)	**512,95,24,701**	**474,73,96,908**

Place : Bangalore,

Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Balance Sheet as at 31st March 2017

(Amount in ₹)

		SCHEDULE 8	Current Year		Previous Year	
		CURRENT ASSETS, INVESTMENTS, LOANS & ADVANCES				
A		**CURRENT ASSETS:**				
	1	**Inventories:**				
		a) Stores and Spares		3,793		3,793
	2	**Sundry Debtors:**				
		a) Debts Outstanding for a period exceeding six months	23,25,63,371		19,16,11,338	
		b) Debts Outstanding for a period not exceeding six months	12,45,55,926	35,71,19,297	17,59,47,248	36,75,58,586
	3	**Cash balances in hand (including cheques/drafts and imprest)**		22,36,173		5,90,701
	4	**Deposits and Bank Balances:**				
		a) Deposits with Scheduled Banks (includes margin money)	1,57,95,072		179,45,73,999	
		b) Margin Money Deposits on Grant account	32,28,86,500		32,04,76,000	
		c) Deposits earmarked for Superannuation Fund	55,39,24,902		20,58,33,296	
		d) Savings Accounts	84,05,40,783	173,31,47,257	100,70,22,542	332,79,05,837
		e) Deposits of Maintenance, Renewal & Obsolescence Reserve	6,45,00,000		7,00,00,000	
		f) Savings Bank account of Maintenance, Renewal & Obsolescence Reserve	63,52,328		44,98,977	
		g) Accrued interest on MRO Fund & TDS Receivable etc.,	13,22,021	7,21,74,349	10,96,257	7,55,95,234
B	1	Investments				
		a) In Joint Venture				
		Investment in Shares of Joint Venture Company, M/s National High Power Test Laboratory Pvt Ltd., New Delhi	23,90,00,000			23,90,00,000
		Add: Amount paid for allotment of Additional Shares	6,50,00,000	30,40,00,000		
		b) Long Term Investments				
		Government Securities	3,10,58,749			
		Bonds	176,25,00,000			
		Term Deposits with Banks & Financial Institutions	17,50,00,000	196,85,58,749		
C		**LOANS, ADVANCES & OTHER ASSETS**				
		a) Deposits with Govt.Depts & others	8,45,58,930		7,61,55,604	
		b) Advances to Employees	90,55,027		1,29,48,964	
		c) Prepaid Expences	22,30,329		31,25,809	
		d) Accrued interest	13,05,51,160		8,67,24,207	
		e) Tax Refund Receivables	37,53,21,243		30,74,78,677	
		f) Other Claims Receivable	2,27,52,864		1,52,64,332	
		g) Other Advances	4,41,50,439	66,86,19,992	1,84,80,569	52,01,78,162
		TOTAL		**510,58,59,610**		**453,08,32,313**

Place : Bangalore,
Date : 31-05-2017

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2017

(Amount in ₹)

	SCHEDULE 9	Current Year	Previous Year
	INCOME FROM TEST FEE & CONSULTANCY		
a)	**Test Fee**	146,98,90,075	121,70,50,229
b)	**Consultancy Services Charges**	14,48,92,980	17,34,00,637
	TOTAL	**161,47,83,055**	**139,04,50,866**

Place : Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2017

(Amount in ₹)

	SCHEDULE 10	Current Year	Previous Year
	FEES		
a)	**Training Fee**	92,03,459	1,87,67,871
b)	**Seminar Fee**	1,20,76,130	83,80,118
	TOTAL	**2,12,79,589**	**2,71,47,989**

Place : Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2017

(Amount in ₹)

	SCHEDULE 11	Current Year	Previous Year
	INTEREST EARNED		
a)	**Interest on Term Deposits with Banks & Financial Institutions**	19,34,70,628	16,15,33,758
b)	**Interest on Loans & Advances to Employees**	14,70,980	22,80,285
	TOTAL	**19,49,41,608**	**16,38,14,043**

Place : Bangalore,
Date : 31-05-2017.

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure
for the year ended 31st March 2017

(Amount in ₹)

		SCHEDULE 12	Current Year	Previous Year
		OTHER INCOME		
1)		**Fees for Miscellaneous Services**		
	a)	Sale of Publications	7,78,227	7,56,010
	b)	Library Receipts	7,845	16,980
2)		**Miscellaneous Income**		
	a)	Application fee on recruitment	,5,500.00	6,70,206
	b)	Sale of Tender forms	2,68,600	1,14,695
	c)	Licence fees	27,51,513	28,47,930
	d)	Rent Receipts	32,42,068	14,38,521
	e)	Sale of Scrap	32,921	48,486
	f)	Others	4,03,652.00	46,76,779
		TOTAL	**74,90,326.00**	**1,05,69,607**

Place : Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2017

(Amount in ₹)

	SCHEDULE 13	Current Year	Previous Year
	RESEARCH ESTABLISHMENT EXPENSES		
a)	Salaries and Wages including Bonus	50,65,84,931	45,79,07,467
b)	Staff Welfare Expenses	2,52,28,885	3,19,91,081
c)	Expenses on Employee's Retirement and Terminal Benefits	55,39,24,902	20,58,33,296
d)	Expenses on Medical Facilities	1,83,32,892	1,53,71,366
	TOTAL	**110,40,71,610**	**71,11,03,210**

Place: Bangalore,
Date : 31-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

CENTRAL POWER RESEARCH INSTITUTE, BANGALORE.

Schedules forming part of Income & Expenditure for the year ended 31st March 2017

(Amount in ₹)

	SCHEDULE 14	Current Year	Previous Year
	RESEARCH ADMINISTRATIVE EXPENSES		
a)	Electricity and Power	7,46,23,651	7,14,81,618
b)	Water Charges	16,93,194	4,64,061
c)	Office Expenses	5,18,84,978	4,48,72,069
d)	Repairs and Maintenance	15,80,99,736	16,19,50,935
e)	Rent, Rates and Taxes	11,69,583	5,16,674
f)	Vehicles Running and Maintenance Expenses	40,47,799	36,97,500
g)	Postage, Telephone and Communication Charges	38,81,590	50,35,259
h)	Printing and Stationary	20,57,603	44,48,683
i)	Travelling and Conveyance Expenses	1,62,17,573	1,43,90,885
j)	Expenses on Seminar & Workshops	78,26,672	1,08,97,145
k)	Subscription Expenses	88,407	83,775
l)	Expenses on Fees	72,327	1,14,691
m)	Auditors Remuneration	1,75,000	1,25,000
n)	Professional Charges	37,26,022	39,15,180
o)	Library Expenses	51,96,073	25,41,949
p)	Training Expences	13,76,552	11,83,852
q)	Publication Expenses	8,10,048	8,96,513
r)	Advertisement and Publicity	94,50,081	59,78,744
s)	Provision for Doubtful Debts	6,28,60,873	-
	TOTAL	**40,52,57,762**	**33,25,94,533**

Rao & Emmar Chartered Accountants BANGALORE

Place: Bangalore,
Date : 31-05-2017.

CENTRAL POWER RESEARCH INSTITUTE

Schedule forming part of Income & Expenditure for the year ended 31st MARCH 2017

SCHEDULE 15

DEPRECIATION

(Amount in ₹)

YEAR	GROSS BLOCK				DEPRECIATION				NET BLOCK	
	OB	Additions		TOTAL	%	OB	For the Year	Total	OB	CB
		Additions	Transfer from W-I-P to Assets							
1	2	3	4	5		6	7	8	9	10
				(2 + 3 - 4)				(6 + 7)	(2 - 6)	(5 - 8)
Land	6,96,84,860			6,96,84,860					6,96,84,860	6,96,84,860
Buildings	88,25,09,684	2,07,74,545	6,35,86,935	96,68,71,164	3.34	38,25,90,810	2,97,67,685	41,23,58,495	49,99,18,874	55,45,12,669
Plant & Machinery	578,79,76,872	2,45,14,643	25,82,09,060	607,07,00,575	4.75	381,68,58,816	15,35,98,630	397,04,57,446	197,11,18,056	210,02,43,129
Plant & Machinery (Spons)	17,50,04,383	91,90,942		18,41,95,325	4.75	8,16,42,332	63,12,215	8,79,54,547	9,33,62,051	9,62,40,778
Furniture & Fixtures	2,30,72,328	19,99,169	62,611	2,51,34,108	6.33	1,30,24,767	12,28,387	1,42,53,154	1,00,47,561	1,08,80,954
Vehicles	51,40,342			51,40,342.00	9.50	47,90,091	62,114	48,52,205.00	3,50,251.00	2,88,137.00
Library Books	1,43,65,050	4,49,368		1,48,14,418	95.00	1,36,46,797	4,26,900	1,40,73,697	7,18,253.00	7,40,721.00
Films (docmntry)	2,25,153			2,25,153	95.00	2,13,895		2,13,895.00	11,258	11,258
Sub Total	*695,79,78,672*	*5,69,28,667*	*32,18,58,606*	733,67,65,945					*264,52,11,164*	*283,26,02,506*
Capital Works in Progress (M o P)	53,81,57,269	75,06,92,666	32,18,58,606	96,69,91,329					53,81,57,269	96,69,91,329
Capital W-I-P (CPRI)	71,03,651			71,03,651					71,03,651	71,03,651
TOTAL	750,32,39,592	80,76,21,333	0	831,08,60,925		431,27,67,508	19,13,95,931	450,41,63,439	319,04,72,084	380,66,97,486

Place: Bangalore,

Date : 30-05-2017.

Rao & Emmar Chartered Accountants BANGALORE

Schedule - 16

APPENDIX - 11

Significant Accounting Policies attached to and forming part of Accounts for the year ended 31st March 2017.

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 I6th 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 2017 is of the order of Rs. 245,21,89,649-00 (for assets. additions from 1981).

There is a difference between the Capital Reserve and Fixed Assets Gross block to the tune of Rs. 5.51 Crore. During the financial year 2010-11 an amount of Rs. 471.46 lakhs being the proceeds of sale of assets at TRC Koradi was received and fixed assets to the tune of Rs. 482.34 lakhs was reduced in Fixed Asset schedule but not in Capital reserve. Similarly the surplus on sale of Fixed Asset of Rs. 54.13 lakhs as on 31-03-2017 has been added to Capital reserve.This accounts for the difference of Rs. 428.21 lakhs. The

APPENDIX - 11

Schedule - 16

remaining difference of Rs. 1.23 crores is under reconcilition to determine the amount to be returnable or otherwise to Government of India out of sale of Capital Assets procured out of grants.

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

3. Investments : Investments are shown at cost.

4. Inventories :

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

5. Research and Development :

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

6. Foreign Currency Transaction :

Transactions in Foreign Currency are recorded at a notional rate of exchange.

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

7. Revenue Recognition :

The Revenue in respect of Test Fees and Consultancy charges are accounted on completion of work / report. The policy of the Institute is to account the 'TDS Receivables' on receipt of Form 16 from the report. The institute is under correspondence with users to get the Form 16 to the extent of around Rs. 203 lakhs.

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

8. Retirement Benefits :

(i) Post- employment benefit plans :

(a) Defined Contribution Plan -

Contribution to New Pension Scheme are accrued in accordance with applicable statute and managed as per Government rules and regulations.

(b) Defined Benefit Plan -

The liability towards retirement benefits like Pension, Gratuity and Leave Encasement 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.

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

(B. J. Praveen)
Partner
Membership No. 215713

Bangalore
31-05-2017

(N. R. Padmanabha)
Chief Accounts Officer

(V. S. Nandakumar)
Director General

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Notes on Accounts & Contingent Liability attached to and forming part of Accounts for the year ended 31st March 2017.

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. 91.89 lakhs for 2016-17 (Rs. 13.30 lakhs for the previous year) and Rs. 1104.48 lakhs upto 2016-17.

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. (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 (1) 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 CPRI on account of above mentioned projects is Rs. 110.20 Crores. To meet the above expenditures, CPRI has created a reserve by name "Reserve for Capital Expenditure out of CPRI generated funds" and the credit balance under this reserve as on 31-03-2017 is Rs. 36.79 Crores.

(b) In accordance with the approval of Government of India, Ministry of Power vide letter No. 5/18/2007-T&R dated 16-01-2012, an amount of Rs. 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

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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 balance 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 alloted to us and the share certificate for Rs. 650.00 lakhs has been received.

4. Retirement Benefits : The liability on account of Pension, Gratuity etc., was evaluated as on 31.03.2016 through M/s LIC of India and the liability has been estimated at Rs. 52,799.52 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.

Accordingly, a sum of Rs. 5539.25 lakhs has been charged to Income & Expenditure Account during the current year, The cash of Rs. 5539.25 lakhs will be transferred to Superannuation Fund during the financial year 2017-18.

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 Hon'ble 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 07-04-2016 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. 2515.89 lakhs from Assessment Years 2003-2004 to 2014-2015.

The present position of Income Tax cases, Assessment Year wise

Sl. No.	Assessment Year	Issue and Status of the cases as on 31-03-2017
1	2001-02	Department has raised Demand of Rs. 1154.61 lakhs vide notice dtd 12.12.2008 for the AY 2001-02 to 2004-05 and for 2006-07. For the AY 2005-06 similar case is pending before ITAT. The order of CIT (A) appeals was in favour of the Institute against which department gone on appeal in the ITAT which were dismissed by ITAT by Order No: ITA No. 1200/Bang/2008 and 379-382/09 dated 05-05-2017.
2	2002-03	
3	2003-04	
4	2005-06	
5	2006-07	
6	2007-08	Income Tax department has issued a demand notice for payment of Tax of Rs. 135.45 lakh vide order dtd. 13.09.2011 and adjusted the said amount out of refund due for the AY 2011-12. Institute has appealed and the case was decided in favour of the Institute on 12.09.2013. The department filed appeal in the ITAT and the case is pending adjudication.
7	2009-10	Department has raised demand for Rs. 80.78 lakhs and was adjusted the refund due for the AY 2011-12 and the Institute filed an appeals with CIT (A) appeals which is pending for adjudication.
8	2011-12	The case is pending before ITA-13, Bangalore. The advocate for CPRI submitted the appeal on 16.03.2017. The respondent authority has not given its findings on the issue.
9	2011-12	Department has raised demand for Rs. 1010.21 lakhs on the Institute and the Institute filed an appeals with CIT (A) appeals which is pending adjudication.
10	2012-13	Department has raised demand for Rs. 1111.84 lakhs and the Institute filed an appeals with CIT (A) appeals, which is pending for adjudication.
11	2012-13	The advocate for CPRI appeared before ITA-13, Bangalore on 16.03.2017 and submitted the appeal. The respondent authority has not given its findings on the issues.
12	2013-14	
13	2014-15	

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6. Service Tax Cases

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

(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 service 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. CPRI had received a request for refund of unutilized test charges of Rs. 4,10,900/- from M/s. Jabshetty Transformers, Gulbarga 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 detail which they provided through an email. Based on the RTGS details given by them, CPRI transferred Rs. 4,10,900/- to the account as provided ie. M/s M&CDCC Bank Ltd. Mysore.

On informing M/s. Jabshetty Transformers through email about the transfer of the above amount, they informed back that they did not ask for refund/transfer and also no money had reached to their account.

On enquiry it was found that Shri B Puttaraju, the representative of the M/s. Jabshetty had fictitiously created another account in the name of M/s. Jabashetty Transformers in M&CDCC Bank Ltd., Mysore.

M/s. Jabshetty Transformers has sent legal notice for refunding the amount which was transferred to M/s. Jabashetty Transformers Account. This is being defended by our Legal Advisers, Ravi, Suri & Sunitha, Malleswaram, Bangalore.

A case was also filed in this regard, in the Sadasivanagar Police Station on 20th Oct. 2016

The matter is still pending.

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 2015-16).

(b) Estimated amount of liability on account of capital contracts - Rs. 5,430.98 lakhs. (Rs. 3,664.27 lakhs for 2015-16).

(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. 676.01 lakhs for 2016-17 (Rs. 570.83 lakhs for 2015-16), 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. 812.12 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 31.03.2017 are Rs. 3228.87 lakhs (Rs. 3204.76 lakhs as on 31.03.2016).

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 RAO & EMMAR
Chartered Accountants
FRN - 003084S

Bangalore
31-05-2017

(N. R. Padmanabha)
Chief Accounts Officer

(V. S. Nandakumar)
Director General

(B. J. Praveen)
Partner
Membership No. 215713

CENTRAL POWER RESEARCH INSTITUTE

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