



# CPRI



## Central Power Research Institute

Ministry of Power, Government of India

Research | Evaluation | Consultancy | Training



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*Head Office*

## **A | Profile**

Central Power Research Institute (CPRI) is an autonomous Society under the Ministry of Power, Government of India. Set up in 1960, the Institute has several Research and Testing laboratories engaged in different specialised fields. The headquarters of the Institute is in Bangalore and its Units are located at Bhopal, Hyderabad, Nagpur, Noida, Kolkata and Guwahati. A unit in Nasik is being established.

### **Activities of CPRI:**

1. Applied Research in Electrical Power Engineering
2. Testing & Certification of Power equipment
3. Consultancy and Field Testing Services to Power Utilities and Industry
4. Third Party Inspection and Vendor Analysis
5. Customized Training programs for Utilities & Industries

### **Accreditations:**

- ISO/IEC 17025: 2017 accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) - Traceable to international bodies like International Laboratory Accreditation Co-operation (ILAC) and Asia Pacific Laboratory Accreditation Co-operation (APLAC)
- Bureau of Indian Standards (BIS)
- Intertek - ASTA, UK
- ISO 9001:2015 Certification for Research and Consultancy activities

## **Credentials:**

- Member of Short Circuit Testing Liaison (STL)
- Corporate Member on DLMS UA (Device Language Message Specification User Association) and UCA IUG (Utility Communication Architecture International User Group)
- Approved by INMETRO Brazil as a third party testing laboratory for Brazil Energy Labeling Program on Transformers
- Approved by Electricity Water Authority (EWA), Kingdom of Bahrain - Electricity Distribution Directorate (EDD) as an Independent Testing and Certification Body.
- Association with Underwriter's Laboratories (UL) and TUV Rheinland India Pvt. Ltd. for Testing & Certification

## **Research & Development:**

The Institute promotes applied Research leading to technology development in Power Sector. With the State-of-the-art infrastructure, CPRI has been carrying out R&D in the areas of electrical Power Generation, Transmission and Distribution in the endeavor to assist the Power Utilities to supply reliable, uninterrupted, safe and quality power to the consumers at affordable cost. The Center for Collaborative & Advanced Research (CCAR) has been established with the aim of creating a conducive environment for collaborative research between R&D Institutions, Industry and Academia.

## **Testing & Certification:**

CPRI has built up expertise to cater to the entire gamut of services required by Power Sector covering Generation, Transmission and Distribution under one roof. CPRI houses unique facilities for evaluation of EHV/UHV equipment going into the 800kV/1200kV system. Test facilities have been created for:

- High Power Short Circuit testing of Transformers/Switchgear
- Transmission line Tower & accessories
- Power Cables
- Capacitors
- Material characterization including CRGO
- Insulators & Lightning Arresters
- Vibration studies
- Relays, Energy Meters and Smart Meters
- Refrigerators and Air Conditioners
- Domestic appliances including LED and SPV Lighting Systems.

The Institute has expertise for Seismic Qualification of electrical equipment, Real Time Digital Simulation for Power Systems Studies and Communication Protocol for Power System Automation.

### **Consultancy:**

CPRI offers consultancy in the areas of Diagnostic & Condition Monitoring of HV substation and Power plant electrical equipment, Site testing of Transformer oil, Power System Studies, Real Time Simulation of Power System Controls, Protection Audit - Generating stations and substations, RLA and R&M of Thermal & Hydro Power Plants, Non-destructive evaluation of Thermal Power Station plant equipment, Corrosion mapping of water wall tubes of Boilers, Energy Efficiency Services like Energy Audit, Fuel Audit of Thermal Power Stations, Power System Automation / Distribution Automation, Smart Grid.

The Institute offers Third Party Inspection Services and Vendor Assessment for Utilities. CPRI is also offering its services for programmes initiated by Government of India.

### **Training :**

CPRI has been in the forefront for disseminating the knowledge assimilated by way of in-house Research through organising Technical Programmes. The training modules are designed to comprehensively address the specific needs of the power sector Utilities.

### **Services for Overseas Customers:**

CPRI has been addressing the electrical equipment testing requirements of overseas countries like Nepal, Bhutan, Bangladesh, Myanmar, Thailand, Malaysia, Indonesia, Sri Lanka, Korea, Japan, UK etc. Besides the Certification, Consultancy and Training services are also utilized by the Utilities and Industries in countries of Middle East, South East & Far East Asia and Africa. Today, CPRI services are being sought by countries like USA, Europe, Australia, New Zealand and various other countries.



Ministry of Power (MoP), Govt. of India, is promoting Research and Development on identified thrust areas for the benefit of Indian Power Sector through three R&D schemes viz. R&D under National Perspective Plan (NPP), Research Scheme on Power (RSoP) and In-House R&D (IHRD). CPRI has been entrusted with the responsibility of coordinating and monitoring the R&D schemes of the Ministry of Power (MoP), Government of India and also schemes like Uchhatar Avishkar Yojana (UAY) and Impacting Research Innovation and Technology (IMPRINT) under MHRD, where MoP is a stakeholder.

### **National Perspective Plan (NPP)**

This Scheme aims at product/process developments with indigenous technologies. Essentially, NPP projects address issues of National importance and have an industry partner to ensure that the research output translates into commercial product.

### **Research Scheme on Power (RSoP)**

The RSoP scheme mainly deals with application oriented research. This scheme has attracted keen interest from academia. In addition, Central and State Power Utilities can also apply under this scheme for solving their operational problems. This scheme is facilitating research capacity building in academia.

### **In-House R&D Scheme (IHRD)**

The IHRD scheme is exclusively for Scientists and Engineers of CPRI. Research Projects are undertaken for:

- Augmentation of Research and Testing facilities
- Improvements / New techniques in testing / Diagnostic methods / Research studies
- Product / Process Improvements
- Evolution of National standards

## C | Central Research and Testing Laboratories, Bengaluru

The Institute has excellent facilities to address the requirements of Power Sector in various specialized fields. CPRI has established State-of-art laboratories and over the years each laboratory has developed expertise and offers Research, Testing and Consultancy in specific focused areas. A brief overview of the facilities is detailed below:

### 1. Cables and Diagnostics Division

**Test Facilities:** Diagnostic Testing & Condition Assessment studies on High Voltage Substation & Power Plant Electrical Equipment in service, Power Cables Testing and Flame Retardant Low Smoke Cables and Materials

#### **Cables Laboratory:**

- Tests on Power Cables & Accessories of voltage rating up to 220 kV
- Pre-qualification tests on EHV Cable systems up to 400 kV Rating
- Fire Reaction tests on electric Cables, insulating and composite Materials

*EHV Cable testing - 2400 kV, 240 kJ Impulse Generator*



## **Diagnostics Laboratory:**

### **Consultancy through Field Testing:**

Condition assessment of HV Power Equipment like

- Power Transformers
- Hydro and Turbo Generators
- Power Cables
- Large AC Motors
- Current Transformers (CTs)
- Capacitance Voltage Transformers (CVTs)
- Lightning Arresters etc. in service

### **Insulation Laboratory:**

Tests on Solid Insulating materials, namely - paper, pressboard, insulating mats, epoxy, reinforced fibre, coatings, mica sheets, cable insulations, ceramic and polymeric insulations, clamps and connectors for AB cables, heat shrinkable materials, earth rods, cable clamps.

Specialised tests such as Climatic Ageing using Xenon Arc and Fluorescent lamps to simulate UV radiations, corrosion tests of salt spray, Sulphur dioxide gas, environmental conditions etc. are also taken up by the lab.

*Cyclic Corrosion Test Chamber*





## 2. Capacitors Division

*HT Capacitor under test*

- Testing and Evaluation of LV and HV Power Capacitors
- LV APFC Panels upto 500 kVAR, 440V for all tests as per National and International Standards.
- Environmental tests on various equipment - Electrical, Mechanical, Automobile, Medical, ATMs, etc.

*Testing of LV APFC Panel*





### 3. Dielectric Materials Division

#### *Transformer Oil Test Facility*

**Liquid Dielectrics Laboratory:** Unused oil before filling into the transformer has to undergo quality test and Used (In-Service) Transformer oil is required to be analyzed as per Standards. The Dissolved Gas analysis of used (in-service) transformer oil helps in finding faults in transformers like Arcing, Sparking, Over heating or burning of solid insulation in incipient stage itself. Estimation of Furan content in Transformer oil is useful in assessing the condition of solid insulation in the transformer.

#### **Facility for Evaluation of :**

- Unused (New) Mineral Insulating Oils for Transformers
- Used (in-service) oils for Transformers
- Degree of polymerization, Furan and Dissolved Gas Analysis
- Lead (Pb) content in paints
- Synthetic and Natural Esters
- Silicone oils
- Oil compatibility studies



*Thermal Conductivity Equipment*

**Lubricating Oil Laboratory:** Evaluation of turbine, hydraulic and gear oils.

**Polymer Laboratory:** Evaluation of Polymeric materials / Composites for thermal, thermo-mechanical and calorimetric profiles.

Management of Polychlorinated Biphenyl (PCB) and their disposal: Evaluation of PCB in oils and disposal of PCB contaminated oil using PCB dechlorination mobile plant up to 10000 ppm.

## 4. Distribution Systems Division

**Facilities:** Power System Analysis Software for Power Distribution Network analysis and evaluation.

Consultancy services to the Utilities and Industries in the area of Power Distribution, Energy Accounting /Audit, Study & Analysis of Distribution Network.

Project Management & Third Party Inspection for the following Government schemes:

- Project Management Agency for DDUGJY & IPDS
- Third Party Independent Agency under Rajiv Gandhi Grameen Viduytikaran Yojana (RGGVY)
- Third Party Independent Evaluation Agency - Energy Accounting under R-APDRP
- Third Party Independent Agency under Niranthara Jyothi Yojana (NJY)
- TPIA in various distribution companies like, BESCO, CESC, GESCOM, HESCO, MESCOM and HRECS, Hukkeri of Karnataka; KSEB, Kerala.
- Third Party Inspection & Evaluation of HVDS works for State Utilities.
- Third Party Factory Inspection of Power Distribution Components for State Utilities
- Workshop/Conference/Training are conducted in Power Distribution Technologies & Network.

*Monitoring of RGGVY Works*





*Tri-axial Shaker System*

## 5. Earthquake Engineering and Vibration Research Centre

**Test Facilities:** Seismic, Shock and Vibration Qualification of Instruments / Electrical Equipment for Power Plants and Substations.

### Earthquake Engineering Laboratory :

- Tri-axial shaker system with six degrees of freedom, Table size: 3.0 x 3.0 m, Maximum pay load: 10 tons, Frequency range: 0.1 to 50 Hz
- Servo hydraulic shaker system: Table size: 1.5 x 1.5 m, Maximum pay load: 1 ton, Frequency range: 1 to 250 Hz
- Electro dynamic shaker systems with slip table. Force rating 25 kN and frequency range 5 to 3500 Hz.
- Climatic chambers: Temperature and humidity environmental test facility.



*Servo hydraulic shaker system*



## 6. Electrical Appliances Technology Division

**Test Facilities** for Refrigerator, Air Conditioner, Fan and Battery - Recognized by BEE for Star and Labelling Programme, Ingress Protection Testing.

**Air Conditioner Testing Laboratory:** The laboratory has "Balanced Ambient Calorimeter" (BAC) for testing the Unitary and Split Air Conditioners for capacity up to 10500 watts, to perform cooling capacity and power consumption test and maximum operating condition test.

**Refrigerator Testing Laboratory:** The facility has testing of four refrigerators at one go independently. The lab undertakes testing of domestic type frost free refrigerators and direct cool refrigerators of volume up to 1000 litre for Energy consumption test, pull down test and volume measurement tests.

*Refrigerator Testing in Progress*



*IPX4 Test in Progress*



**Ingress Protection Testing Laboratory:** The lab is equipped with dust test chamber to perform IP 5X and 6X to accommodate the test panels/ samples of size up to 2.2 m x 1.8 m x 2.5 m (W x L x H) and water test facility to perform tests ranging from IP X1 to X8 test. The Lab undertakes the tests ranging from IP 11 to IP 68.

The laboratory is being augmented with huge dust chamber to accommodate the large panels / samples of size up to 5m x 4.5m x 4.5m (W x L x H) and of weight up to 15 Tons. The lab is equipped with 15 Tons EOT crane for hassle free material handling. The laboratory will accommodate large test sample like Heavy motor, Compact substations, electrical panels etc.

The Water immersion tank is available to conduct IP X7 and X8 for sample of size up to 3.5m x 3.5m x 4m (W x L x H).

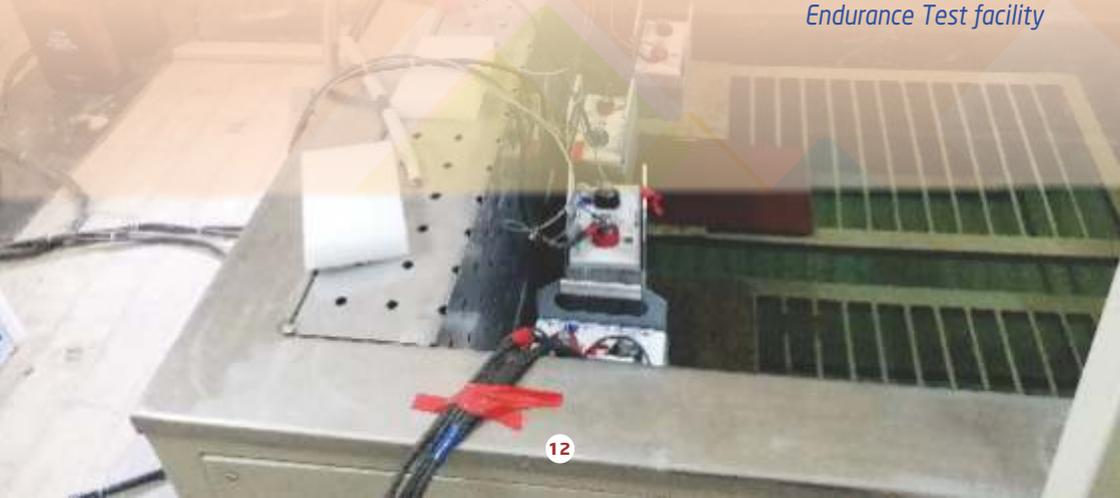
IP X9 test facility is being established for first of its kind. The test is performed in water with high temperature and pressure. The Lab shall under take the tests ranging from IP 11 to IP 69.

**Fan Testing Laboratory:** The Laboratory undertakes tests on Ceiling Fans of all types and Table Fans.

**Battery Testing Laboratory:**

- The laboratory involved in Testing and Certification of all types of batteries irrespective of their chemistry such as Lead-acid, Lithium-ion and Ni-Cd batteries.
- Total thirty six cell and batteries can be tested at a time. Battery or cell up to 4000 Ah@c10 and battery bank up to 450V and 3000Ah@c10 can be tested.
- Besides testing, R&D activities in area of energy storage materials, electrode and devices fabrication are also being carried out.

*Endurance Test facility*



*Solar Module Test Facility*



## 7. Energy Efficiency and Renewable Energy Division

### Renewable Energy and Energy Efficiency Products Testing:

- LED Lamps as per IS specifications
- Solar PV Lanterns and Home Lighting Systems as per MNRE specifications
- Grid Tied Solar Photovoltaic Inverter facility upto 500kw
- Induction Motors up to 55 kw
- Power converters including Inverters
- Solar Pumps as per MNRE / manufacturers specification (0.2-15 HP submersible / surface AC/DC pumps)
- Solar PV modules upto 500Wp
- Environmental test chamber facility for all equipment

*Grid Tied Inverter Test Facility*



## **Consultancy Services:**

Special Consultancy Services are being rendered for Fuel Audit Study; Assessment and fixation of heat rate for regulatory bodies; Ex-bus capacity assessment of power plants; Technical minimum study.

## **Energy Audit Studies:**

Performance evaluation of Boilers and combustion systems; Steam turbine generators; Auxiliaries -pumps, fans, mills, blowers, etc. and associated motors; Heat exchangers - feed water heaters, lube/seal oil coolers, gland/stack/vent steam condensers, etc.; Steam surface Condensers; Cooling towers as per CTI ATC 105; Utilities - compressed air, water pumping, air conditioning, refrigeration; Gas turbines, generators; Hydro turbines, generators; Electrical distribution networks transformers, cables and conductors, switchgear.

*Gonio - Photometric Test Facility for LED Lighting System*





## 8. High Power Laboratory

*Top view of High Power Laboratory*

**Test Facilities:** Short circuit testing of Power Transformers, Instrument Transformers, Switchgear & Control gear and other allied power system equipment. Lab is equipped with mechanical & switching performance test facilities for switchgear equipment.

*2500MVA Short Circuit Generator*



- High Power Laboratory houses 2500MVA, 14kV Short Circuit Generator and has Direct three phase testing facility of 2500MVA capacity at 36/72.5 kV and single phase testing facility of 1400 MVA capacity at 42/84/168/252kV.
- Short circuit withstand capability tests on Power Transformers, Wave Traps, Reactors, Insulator Strings, Lightning Arresters etc., Short time current test up to 300kA rms for 1 sec on Busducts, CTs, Isolators, Panels, etc.
- Synthetic Test facility for short circuit making, breaking and switching testing of EHV Circuit Breakers up to 50kA, 245kV full pole and unit testing of EHV Circuit breakers beyond 245kV level.

*60 / 84 / 100 MVA, 220 / 55 / 55 kV Scott connection  
Traction Transformer under SC test*





## 9. High Voltage Division

*3MV, 150kj Impulse Voltage Generator*

**Facilities** for High Voltage Tests on Power/Distribution Transformers, Current Transformers, Potential Transformers, Air Break Switches, Isolators, Cables, Bushings, Insulators, Insulator Strings, Circuit Breaker Panels, Auto Reclosers, Power Line Accessories etc. up to and including 400 kV system.

- Impulse Voltage Generator of 3 MV, 150 kj.
- Power frequency Cascade Transformers setup of 1800 kV (i.e. 3 nos. of 600 kV) and Artificial rain equipment (small and big) for wet tests
- 50 tons Universal Testing Machine for Electro Mechanical / Mechanical test.

### **Pollution Laboratory:**

- Dimensions of 12mx12mx12m
- Artificial Pollution tests on insulators by salt fog solid layer method can be conducted up to 400 kV AC and Design test on Composite Insulators.
- Ageing studies on Surge Arrester & Insulating materials.

### **Impulse Current Laboratory:**

- Comprehensive facility for Type testing of Zinc Oxide blocks/pro-rated sections from 3kV to 12kV rating as per IEC 60099-4 and IS 15086-4.
- Unique Computer-controlled Impulse Current Generator of rating 100kV, 300kj incorporating all conceivable features in a single consolidated design.



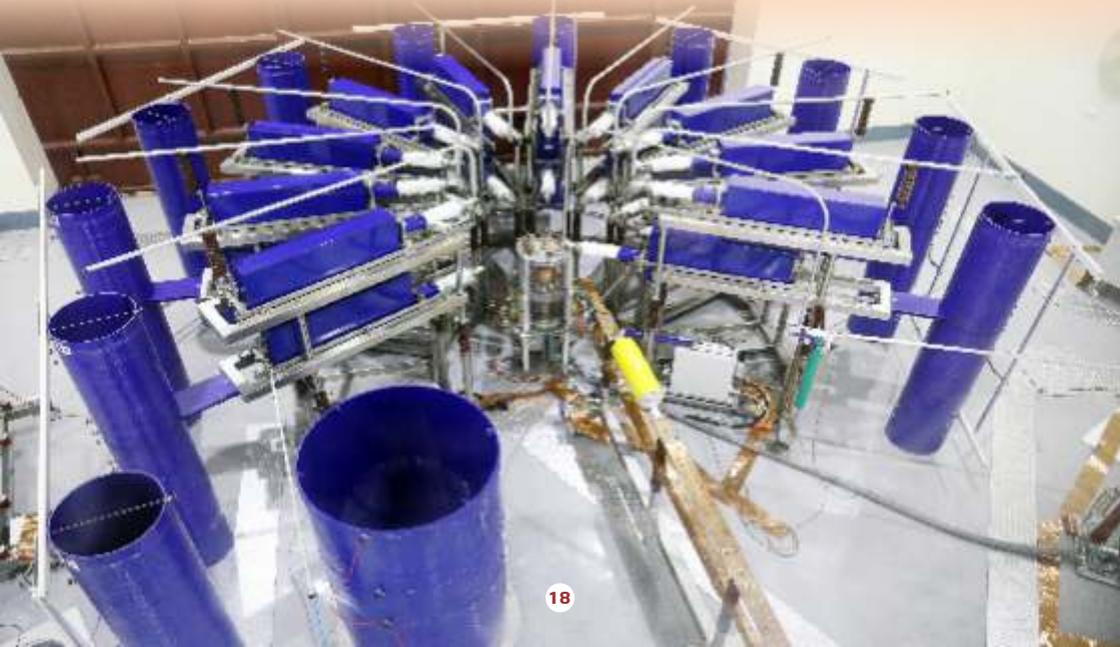
1800kV, 2000kVA Cascading Transformers

### **Thermo Mechanical Test Chamber:**

- The dimensions of the chamber is 45 m x 0.15m x 1m
- Bending moment test on arrester units of voltage rating varying from 9kV to 156kV (maximum unit length of 2000 mm approximately).

### **Consultancy:**

- Pollution level measurements at sites enrooting transmission line
- Design of grounding system for Industries, LV/HV Substations and Generating Stations
- Measurement of Soil resistivity and Earth Resistance for different electrical systems
- Adequacy check of existing earthing system.



100 KV, 300 KJ Impulse Current Generator

## 10. Materials Technology Division

**Facilities:** Materials Characterization and Evaluation, Coal & Fly ash Testing, Mechanical & Wear test, Non-Destructive testing, Field engineering services and consultancy.

### **Material Characterization and Evaluation:**

Materials evaluation using analytical Facilities like SEM, EDAX, XRD, Microscopy, Spectroscopy, Residual stress, CRGO and CRNGO electrical steels.

### **Coal & Fly Ash Testing:**

Coal quality characterization & coal combustion studies including CFD modeling.

### **Mechanical & Wear test:**

Tensile strength, Fatigue, Impact, Creep, Hardness, Wear and erosion test.



*Residual stress test - XRD based*

*CRGO Test for Electrical Steel*



### **Non-Destructive Testing:**

Visual Inspection (VI), Fibro Scope Test (FST), Dye Penetrant Test (DPT), Magnetic Particle Inspection (MPI), Ultrasonic Test (UT), Eddy Current Test (ECT), Thermography Test (TGT).

### **Field Engineering Services:**

Condition Assessment of Power Plant components, Remaining Life Assessment (RLA) for both Thermal and Hydro Power Plant components.

### **Consultancy:**

Failure and Root cause analysis of all the engineering components, Product design & development, Life extension Studies of power plant critical components and Renovation & Modernization (R&M).

*Robotic System for Boiler Water Wall Tube Inspection*





*Testing of Tower*

*Steel Tubular Pole under Testing*

## 11. Mechanical Engineering Division

### **Tower Testing Station (TTS):**

- Square, Rectangular and Triangular based Towers and Poles
- Maximum base width of 26m x 26m square base with 22 x 11 m rectangular base - height 75m
- UTM of 600 KN capacity for pre / post testing calibration of load measuring equipment

### **Consultancy on Design of Transmission Line Towers**

**Vibration Laboratory:** Testing of all overhead transmission line Conductors and associated accessories.

**Universal Testing Machine:** UTM of 100 KN capacity with built in latest world class features has been incorporated which caters to the testing of all types of hardware materials including the testing of individual wires/strands of all types of transmission line conductors.

## Wake Simulation Laboratory:

The Wake Simulation Laboratory is equipped and upgraded with Servo Hydraulic vibration system, facilitates best simulation and world class testing practices for mechanical Fatigue/vibration testing and evaluation of Assembly Insulator string and hardware upto of 1200 kV transmission lines as per National / International Standards.



*View of the lab*

*Wake Simulation Laboratory*





*Energy Meter Test Bench*

## 12. Metering and Utility Automation Division

### Energy Meter Testing (Metrological and Communication Protocol Testing)

- Electro-Mechanical Meters
- Static Energy Meters
- Tri-Vector Meters
- Thread Through Meters
- Prepayment Meters
- Smart Meters

### Calibration Laboratory:

Equipped with Three Phase high precision Comparator of 0.01 class accuracy, Three Phase Phantom load Source and Three Phase precision measuring instrument of 0.02 class accuracy in two versions (Direct mode: upto 20A, With CT: upto 120A).

**Metering Protocol Laboratory:** Conformance Testing of Energy Meters for Metering Protocol.



*Metering Protocol Lab*

**Conformance of Communication Protocol for IEDs:** Communication Protocol Testing of Intelligent Electronic Devices (IEDs) viz Relays, Gateways, RTUs

**Project Management Consultancy Services in the area of Utility Automation and Smart Grid Implementation.**

**Smart Grid Research Laboratory:**

- Assistance for Products' Development
- Project Management Consultancy Services in the area of Utility Automation and Smart Grid Implementation

*Substation Automation System Laboratory*





### 13. Power Systems Division

*Real Time Digital Simulator*

#### **Consultancy Services:**

- Power System simulation using Real Time Digital Simulator (RTDS) for evaluating the real time performance analysis of various types of controllers such as FACTS, HVDC, SVC and dynamic performance analysis of protection relays with hardware-in-the-loop testing
- Facilities for the simulation of large power grids, wind farms/solar farms, very fast electromagnetic transient simulation with FPGA technology using OPAL RT simulator
- Power System studies for Transmission planning and power evacuation, Load flow studies, short circuit studies, stability studies - transient, dynamic and

*OPAL RT Simulator*



voltage stability, Reactive power compensation studies, SSR Studies, Power System equipment protection setting calculations and Relay coordination studies etc. using internationally reputed software

- Third Party Audit of Protection System of Generating stations and Substations.

### **Relay Testing Laboratory:**

- Type testing of Protection Relays: Equipped with the Computerized Relay Test Systems - Omicron make & Doble make for conducting type tests on protection relays used for protection of Generators, Transformers, Bus bar, Transmission line, Reactors, Motors, Capacitors etc., in accordance with IEC: 60255 Standard series and IS: 3231 Standard series

### **Testing of Phasor Measurement Unit (PMU):**

- Fluke make 6135A/PMUCAL Phasor Measurement Unit Calibration system is a unique facility for carrying out Validation/Evaluation of M-class and P-Class Phasor Measurement Unit (PMU's) for both Steady state and Dynamic conditions as per IEEE C37.118.1-2011, IEEE C37.118.1a-2014, IEEE C37.242.2013, IEEE Synchrophasor Measurement Test suite Specification-Version 2-2015 and IEEE/IEC 60255.118.1 (Draft).

*PMU Calibration System 6135A/PMUCAL*





## 14. Short Circuit Laboratory

*50MVA, 12kV Short Circuit Generator*

### **Test Facilities for:**

- Low Voltage Switchgear & Control gear (MCB / MCCB / RCCB / ACB / Fuses / Starter Modules)
- Distribution Transformers
- Instrument Transformers
- Low Voltage Switchgear and Control gear assemblies [LT Panels (PCC/MCC) / Distribution Boards / Feeder Pillars / LV bus ways]
- Test facilities for Current Transformers up to 765kV, 6000A and Potential Transformers up to 66kV class

### **Laboratory is equipped with**

- Two 50 MVA Short Circuit Generators for conducting Short-time withstand current tests of 50 kA rms for 1.0s and 30 kA rms for 3s on various electrical equipment.
- Short Circuit Breaking capacity tests at 50kA, 460V can be performed.
- DC Short Circuit test facility of 600V, 30kA for 3.0s
- Temperature rise test facilities for Distribution Transformers upto 2.5MVA, 33/22/11kV class
- Dedicated Sound proof room for conducting sound level measurement tests on Distribution Transformers.



*30 V, 10000 A Current Source for Accuracy Test on CT*

- All environment test facilities like Dry heat/Damp heat/Glow wire/Ball pressure
- Impulse Test facility for LV equipment.
- Short time over current, Electrical endurance, Fault current making capacity, Short circuit current carrying capacity test facility on Smart Meter / Prepayment Meter.

**Heat Run Test Facilities:** Temperature rise test up to 10,000 Amps on Distribution Boards, LT and HT Busducts, Isolators, Circuit Breakers, Control Panels, CTs & PTs etc.

*Heat Run Test on GIS*





## D | Training Division

CPRI is recognized as one of the Premier Institute for imparting training for the personnel from the Power Sector Utilities. The outcome of the long term research and the consultancy programmes handled by CPRI fraternity over the years has led to the assimilation of a strong, up to date knowledge base in the electrical and power engineering. The expertise has been developed especially in the areas of power generation, transmission and distribution.

Power sector organizations face challenges due to technical and economic changes and need to prepare themselves to adapt to changes and these require up-gradation of skills, knowledge and change in the attitude of the personnel through extensive training. In this context, CPRI plays a vital role in assisting the utilities by regularly conducting training programme which is essential to bring in new dimension to the training needs and strengthen the trained human resource for efficient functioning of the Utilities.

## 1. Regional Testing Laboratory, Kolkata

### Test Facilities:

- Testing of Insulating Oils in Power Transformers as per IS 1866-2000 and Dissolved Gas Analysis for assessing the internal condition of the Transformers.
- Test facilities like Ultra High Performance Liquid Chromatography (UHPLC) to evaluate Furfural content for assessing the condition of solid insulation in Power Transformers.
- The Unit caters to the testing requirements of Electrical Power Equipment Manufacturing Industries, Utilities and Consumers in the Eastern region.

### *Gas Chromatography Apparatus*



## 2. Regional Testing Laboratory, Noida

### High Voltage lab:

- Impulse Voltage Generator of 1000kV, 100kj
- Lightning Impulse Voltage withstand test on Power/Distribution Transformers up to 25MVA
- Transformer Routine Tests upto 1MVA
- Instrument Transformers up to 132kV, HV Switchgears, Bus ducts, fuse units up to 132kV, Insulators up to 66kV
- Temperature Rise Test set up of 6kA



*1000kV, 100kj Impulse Voltage Generator*

### Cables Laboratory:

- DC Test facility up to 5kV DC, 50mA and AC Power Frequency Test Facility up to 60kV, 150mA
- Tests on Cables and accessories - all type tests on XLPE Cables up to 33kV
- PVC Insulated, PVC Sheathed Cables up to 11kV
- FRLS tests on cables and insulating materials

**Liquid Dielectric Lab:** Facilities for testing Transformer Oils as per IS: 1866.

### Energy Meter Lab:

- Energy Meter tests for 1-phase and 3-phase AC static watt hour meter class 1 and class 2
- Facility for Energy Meter Testing at Consumer Premises on behalf of Power Utilities.

*Cable Testing*



*Energy Meter Test Facility*





*1500MVA Short Circuit Generator*

### 3. Switchgear Testing & Development Station, Bhopal

**Test Facilities :** Short Circuit testing of Power Transformers, LV and HV Switchgear, Energy meter Testing, Calibration Laboratory, Transformer Oil Testing

**Station 1:** Direct Short Circuit Test station of 1250 MVA capacity at 12kV capacity utilizing two specially designed 1500MVA Short Circuit Alternators for conducting short circuit tests on High and Medium Voltage Switchgears, Transformers and other allied equipment.

**Station 2:** On-lin Testing Station with 100 MVA from the MPSEB grid caters to Short circuit tests on Low Voltage Switchgears, Transformers and other allied equipment.

**Supplementary Test Facility:**

- 2400kV, 240kJ Impulse Voltage Generator for Impulse test on equipment upto 400kV/800kV class, 20kJ Impulse Voltage Generator for impulse test on equipment upto 132kV class.



*2400kV, 240kJ Impulse Voltage Generator*

- 350kV Power frequency test upto 132kV class
- Ingress Protection test with automatized facility to conduct IP 11 to IP 66
- Instrument Transformer test facility
- All tests on LV Switchgears and Controlgears including Environmental test.

**Energy Meter Test Laboratory:** The laboratory has full type test facility as per National and International standard for Static Energy Meter and Smart Meters up to 100 A.

**Calibration Laboratory:** Calibration Laboratory has facility for electro-technical and thermal parameters.

*Energy Meter Test Facility*





*Computer Aided Feeder Loading Unit*

**Testing Capabilities:**

- Short Circuit dynamic and thermal withstand test facility for Distribution and Power Transformers of rating maximum up to 60MVA, 220kV class
- Transformer loss measurement facility up to 40MVA, 132/33kV class Power Transformers
- Short circuit tests up to 200kArms, 1100 Volts; 200kArms for one second or 100kArms for 3 seconds
- On Load Tap Changer Test facility up to 1000A/ 11 kV for service duty tests and up to 2000A/ 11 kV for breaking capacity tests.
- Temperature rise test facility up to 25kA in three phase set up
- Temperature rise test and loss measurement facilities up to 20MVA, 132kV class Power Transformers
- Internal arc fault test facility for metal enclosed switchgear and motor terminal boxes
- Transformer oil test facility for New Oil and Serviced Oil

*Internal Arc Fault Test on 33kV, 400A, Outdoor Kiosk Panel Breaker Chamber*





*RLA of Hydro Plant*

## 4. Thermal Research Centre, Nagpur

**Facilities:** Life Assessment, Renovation & Modernization and Life Extension studies, Non Destructive Evaluation (NDE) of Thermal Power Station plant equipment like Boilers, Turbines & Condensers etc., and Condition assessment of RCC and steel structures in Thermal Power Plants and Process steam Industries.

- Failure / Metallurgical Analysis of Power Plant /Process Industries components.
- Energy Conservation in Power Plants & improvements in efficiencies of Combustion Auxiliaries and Interconnected Systems.
- Insulation Audit, Steam Audit, Hot Spot Measurement in Boilers, Switch Yards, Transformers etc. i.e. Thermographic Inspection.
- Flaws /crack depth in weld joints and other parts of the equipment by ultrasonic TOFD.
- In-situ Oxide scale measurement in Super Heater and Re-heater tubes and life estimation.



*420 kV OIP Condenser Bushing undergoing Partial discharge and Long duration AC voltage test*

## 5. UHV Research Laboratory, Hyderabad

**Test Facilities** for High Voltage and UHV Equipment / components upto 800kV system (AC/DC)

- Indoor double shielded UHV laboratory with 1200 kV, 2A, 2400 kVA HV test system
- 5 MV, 500 kJ, 25 stage outdoor Impulse Voltage Generator laboratory
- +/- 1200 kV, 200 mA (continuous) outdoor HVDC Generator laboratory
- 1600 kV, 6A, 9600 kVA outdoor Power Frequency Transformer laboratory
- Artificial Pollution testing laboratory
- Transformer Oil testing laboratory

### **Testing Capabilities:**

- Partial discharge measurement test on Current Transformer, Capacitor Voltage Transformer, Bushings, GIS, etc.,
- Accuracy measurement, Type, Routine and Special Tests on Instrument Transformer
- HVDC Pollution test on Insulator strings by solid layer method
- Dielectric test on high voltage electrical equipment



### *Corona Cage*

- Radio interference voltage measurement and corona test on high voltage electrical equipment
- Artificial Pollution test on insulators strings by salt fog method

**Consultancy:** Services are offered in the areas of

- AC electric and magnetic field strength measurement near transmission lines and substation
- DC electric field strength and ionic current measurement near UHV DC transmission lines
- Measurement of radio interference voltage, audible noise on UHV DC / AC transmission lines, substations, valve stations etc.

### *Artificial Pollution Test on 765 kV Insulator Strings*



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### Regional Testing Laboratory

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### Regional Testing Laboratory

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