

# INTERNATIONAL TRAINING PROGRAMMES FOR POWER SECTOR EXECUTIVES 2017 – 2018

*Sponsored by Ministry of External Affairs, Govt. of India  
Under ITEC/SCAAP Program*



**CENTRAL INSTITUTE FOR RURAL ELECTRIFICATION  
of**

**RURAL ELECTRIFICATION CORPORATION LIMITED**

*(A Government of India Enterprise)*

*Website: [www.recindia.com](http://www.recindia.com) & [www.recindia.in](http://www.recindia.in)*

**Promotes Training for Better Tomorrow**

## About CIRE

Central Institute for Rural Electrification (CIRE) is a Training Institute established at Hyderabad (India) in 1979 under the aegis of Rural Electrification Corporation Limited (REC), a Government of India Enterprise.

The objective is to design and conduct training programmes on various topics Related to Electricity Generation, Transmission Distribution and Renewable Energy Systems.

During the last three decades, CIRE has organized various programmes and workshops on Technical, Management, Finance & Accounts, Information Technology aspects of Power Sector.

CIRE has organized programmes on Energy Accounting and Audit, High Voltage Distribution Systems (HVDS) and Clean Development Mechanisms (CDMs) under the financial support of KfW, Germany and customized need based programmes for national & international power sector utilities.

CIRE is also nodal agency for conducting training programmes for A&B and C&D Employees of National Power Utilities and Franchisees throughout the country under National Training Programme (NTP) sponsored by Ministry of Power, Government of India (GoI).

Up to March 2017, Institute has organized 1783 training programmes and trained 38969 Engineers/Managers from various Power Utilities, like Generation, Transmission & Distribution Companies, Electricity Departments, Rural Electric Cooperatives, Regulatory Commissions, Rural Development Agencies, Banks, etc. Since 2005-06, CIRE has organized 78 International Training Programmes under ITEC/SCAAP, sponsored by Ministry of External Affairs (MEA), GoI and trained more than 1200 Executives from about 72 countries.



*CIRE Conference Hall and Main Building*

## PROGRAMMES AT A GLANCE

Sl No	Name of Programme	From	To	Duration in Week	Qualification Required
1	Rural Electrification & Power Management	10 July 2017	01 Sept 2017	8	Diploma/ Degree in Electrical Engineering
2	Solar Power Generation – Grid enabling	10 July 2017	04 Aug 2017	4	Diploma/ Degree in Engineering
3	Design, Erection, Operation, Maintenance and Protection Systems of EHV Substations	07 Aug 2017	01 Sept 2017	4	Diploma/ Degree in Electrical Engineering
4	Power Project Appraisal, Financial Management & Accounting Standards	18 Sept 2017	10 Nov 2017	8	Diploma/ Degree in Electrical Engineering
5	Planning and Management of Power Transmission and Distribution System	18 Sept 2017	10 Nov 2017	8	Diploma/ Degree in Electrical Engineering
6	Best Practices in Power Distribution	13 Nov 2017	15 Dec 2017	5	Diploma/ Degree in Electrical Engineering
7	Management of Power Utilities using ICT/Automated Solutions	13 Nov 2017	15 Dec 2017	5	Diploma/ Degree in Engineering /Computer /IT
8	Certificate Course in Electrical Power Management	08 Jan 2018	30 Mar 2018	12	Diploma/ Degree in Electrical Engineering
9	Trends in Electrical Power Generation	05 Mar 2018	30 Mar 2018	4	Diploma/ Degree in Electrical Engineering

# 1. RURAL ELECTRIFICATION AND POWER MANAGEMENT

(From 10<sup>th</sup> July, 2017 to 01<sup>st</sup> September, 2017) Duration: 8 Weeks

## AIM:

Electricity is an indispensable requirement for all activities of human life. It has been recognized as a basic human need on which the socio-economic development of country depends. Rural Electrification is viewed as a prime mover for rural development to increase agricultural productivity, creating employment, income generation and the basic pre-requisite for all industrial activities. Distribution of electricity to rural areas through grid is more complex by virtue of its nature as it involves high cost & more losses as demand are very low and scattered. In these circumstances, decentralized generation through renewable energy is more helpful for supply of electricity to remote and far-flung rural areas. In recent times, attempts have been made to harness and manage the electricity at local level with active participation of residents for adequate & affordable power.

## OBJECTIVES:

- Impart basic knowledge on Planning, Management and O&M of Rural Electricity Sector
- Familiarize participants with the technical developments related to Rural Electrification and Power Management
- Discuss on different options for local generation and management of power sector in rural areas

## CONTENTS OF THE COURSE:

### Introduction

Power scenario in India  
Organizational Structure of Power Sector  
Reforms, Acts & Policy frame work in Power Sector  
Regulatory Mechanism and way ahead

### Planning of Rural Electrification

Rural Electrification in India – Policies & Challenges  
Funding options and planning of Power Projects  
Institutional Framework for Financing Rural Electrification  
Rural Electrification – sharing of experiences of Participating Countries  
Different options of generation for rural areas  
Generation through other Renewable Mode such as Mini/Micro Hydel, Wind farms, Solar, Bio-mass, municipal waste, etc.

### Design concepts of Rural Distribution Systems

Feasibility evaluation, Project preparation (DPR), Project Monitoring issues  
Design and Planning of Rural Distribution Network  
Selection and sizing of equipments for Distribution system  
Feeder Segregation and Renovation Schemes  
Load Forecasting & Load Management  
Energy Audit & Accounting  
DSM Techniques and Methodology



### **Rural Power Distribution Management**

Optimal Integrated Strategy for Loss Reduction and Voltage Improvement  
Switched capacitors & Reactive Power Compensation  
Quality of Service & Supply  
Standard of Performance for Power Supply  
Rural Power Distribution Management & Participatory Models  
Rural Power Distribution Management by Franchisees

### **Rural Power Distribution Systems - Operation & Maintenance**

Construction Practices & Standards in Rural Power Distribution  
Maintenance of HT & LT Lines, HVDS Systems and alternative options  
Maintenance of Transformers & Sub-Station Equipment  
Protection of Sub-Station Equipment & Ancillaries  
Safety Measures, Prevention of Electrical Accidents and Disaster Management

### **Rural Power Distribution Technologies**

Loss minimization and Innovative & Cost Effective Technologies for Rural Power Distribution  
Distribution Automation & SCADA, Loss minimization Techniques  
REC's Specifications for Materials, Equipment & Unmanned Sub-station  
IT Applications in Power Sector  
DDG & Clean Development Mechanisms in Power Sector  
Electricity Metering, Billing & Collection  
Metering Technologies and their Advancement  
Remote Metering & Pre-paid Metering  
Advance concepts in Rural Distribution

### **Advance concepts in Rural Distribution**

Renewable energy generation (Solar, Wind, Bio mass, Bio Gas)  
DDG Projects and sustainability

### **General Management**

Change Management, Time Management & Communication Process

### **Field Visits**

Power Distribution companies, Franchisees and cooperatives in Distribution Sector,  
Renewable and DDG Projects  
Power Transmission Companies & Regulatory Commissions  
Sub-Stations – 132/33KV & 33/11KV  
Load Dispatch & SCADA Centres



### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** Should be working in Power Sector/Energy Related Organizations/Power Companies or Utilities/Power or Energy Ministry, etc.

**AGE LIMIT:** 25- 45 years

## 2. SOLAR POWER GENERATION - GRID ENABLING

(From 10<sup>th</sup> July 2017 to 04<sup>th</sup> Aug 2017)

Duration: 4 Weeks

### AIM:

Electricity is the backbone infrastructure facility of any country with its manifold applications covering almost every aspect of human life, resulting in galloping demand. Fossil fuel stocks are fast dwindling and there is a need to identify alternative sources of power supply in order to maintain the increasing demand for Human development.

Fuel choice is a vital consideration in planning power stations, every unit that is generated, pollutes the atmosphere unless CDM practices and clean and Green Power Generation is resorted to. Further, non-availability of conventional fuels at required quantities, constraints availability and reliability of power in most of the countries.

Non-Conventional Power Plants are essential for safe guarding environment from total degradation and advances in technology have brought the cost of renewable energy generation at par to conventional.

Among all the non conventional sources, the Solar Power Plants provides greater advantage as this source is endless. Many organizations all over the world are progressing in this direction steadfastly as it is smart, most sustainable and competitive source of electricity generation.

### OBJECTIVES:

- To familiarize participants about estimation of solar potentials
- Design concepts and advances in Solar thermal and PV systems.
- To discuss operation, maintenance, performance and protective systems of solar power plant.

### CONTENTS OF THE COURSE:

#### Over view of Power sector

Concepts and policies, solar power generation in India, policies and government initiatives such as Jawaharlal Nehru National Solar Mission (JNNSM).

#### Solar Thermal Power Generation

Heat transfer from Solar Energy, Radiation Analysis and measurement. Basic Concepts, Stirling and Breyton cycles of Solar Power Generation, Solar steam engine and turbines, parabolic trough power plants, etc

#### Design of Solar Thermal Power Generation System

Tower concept of Solar power Generation (High temp. System) Solar Collectors, Types, Parameters, classification of collectors, materials, and its relative efficiency.

#### Solar Photo Voltaic Power Generation

Development of Photovoltaic Technology and latest trends in the design of Solar Power Plants. Principles & Technologies, Solar Cell Modules, Types of cells, Cell construction, testing and applications

**Design of Photovoltaic Systems:** PV modules, arrays, type of Solar PV Systems such as Standalone, grid interactive and Grid connected, Load estimation – Sizing of the PV array, battery, inverter, etc. – Maximizing efficiency of sub-systems – Balance systems –

Single axis and two axis tracking at optimum inclination of the PV array – Power conditioning and control – Maximum Power Point Trackers, Charge controllers/regulators, DC/DC Converters, DC/AC inverters Selection criteria, Safety issues

Life Cycle Cost analysis – Environment impacts of PV – Green buildings – Potential for GHG emission reduction of installed PV systems - stand alone, Grid connected, etc.

Preparation of detailed project reports, Stipulations under Solar Cost Benefit Analysis, and Tariff fixation in cases of Decentralized Distributed Generation

### **Trouble shooting and Operation and Maintenance**

Best Practices of Operation and Maintenance of Solar Power generation Plant based on Photo voltaic cell technique, Testing of equipment and material Related to Solar power generation

### **Indirect methods of Solar Energy conversion and Concepts of DDG**

Wind energy and Biomass System, Interconnection of multiple renewable sources, Opportunities in Rural Electrification and De-centralized Distributed Generation  
Field visits to solar power plants and panel manufacturing units

**Typical applications of PV – Hybrid systems:** PV-Wind, PV-Diesel engine, PV-Mains - System Sizing examples: Domestic loads, Water pumping, Lighting (using CFLs, White LEDs) - hybrid systems, village power packs – Installation practices

### **Field Visit:**

Field visits to solar PV manufacturers, Utilities, cell & panel manufacturer etc.,

### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Engineering

**WORK EXPERIENCE:** Should be working in Power / Energy Departments of Ministries, Electrical Engineering Department of Universities, Electrical Engineers of Power Utilities, etc.

**AGE LIMIT:** 25 - 45 years



### 3. DESIGN, ERECTION, OPERATION, MAINTENANCE AND PROTECTION SYSTEMS OF EHV SUB-STATIONS

(From 07<sup>th</sup> Aug 2017 to 01<sup>st</sup> Sept 2017)

Duration: 4 Weeks

#### AIM:

With phenomenal growth in the power sector, it has become essential to transmit power with least interruptions and minimum losses requiring revising the transmission voltage levels from the present levels to 765 KV and above with optimum number of transformations, to ensure least possible losses. EHV substations are the nerve centers of the transmission system by controlling and protecting the entire transmission network.

The EHV Sub-stations are essentially needed at load centers to facilitate transformation of power from EHV to voltages of utilization. Longer AC EHV lines have a tendency to carry lesser loads and cause problems of over voltages at the receiving ends on switching and during light loads, necessitating establishment of new switching stations sometimes. Of late, the regulators are also enforcing higher performance standards for transmission utilities to comply with. Penal provisions for non-compliance are in the offing. Efficient and economical design, erection and operation and maintenance procedures of substations without any compromise become paramount in providing reliable supply besides prolonging the life of equipment.

Meeting this changing scenario requires special skills on the part of the executives of the transmission sector to handle the system efficiently and economically and making it essential to undergo training programmes oriented towards subject – specific.

#### OBJECTIVE:

- Equip with necessary skills in the Operation and Maintenance of EHT substations including protection aspects
- Orientation towards the state-of-art technologies in the design of EHV substations with relative merits and cost effectiveness.
- Enhancing the life of the equipment by adopting effective operation and maintenance practices and modern condition monitoring techniques.

#### CONTENTS OF THE COURSE:

##### Introduction to Power Sector

Overview of Power scenario & Indian experience  
Organizational Structure of Power Sector in India  
Restructuring & Power Sector Reforms, Electricity Act, 2003  
Role of Regulatory Commissions in India & International experiences  
National Electricity Policy, Rural Electrification Policy and Tariff policy  
Open Access and trading in power

##### Design Concepts

Identifying voltage levels and location of sub-stations based on power system studies and orientation of feeders  
Salient aspects of Sub-Station Design:  
EHT substations layouts and Bus bar arrangement to be adopted  
Finalising lightning impulse and switching impulse withstand levels, insulation coordination and selection of Lightning Arrestors  
Soil analysis and specific considerations in foundation design



Design aspects of substation main and auxiliary structures  
Specifications & Standards of Substation equipments  
Measuring soil resistivity and design of earth mat and lightning protection  
Design of LT AC and DC systems including battery capacity required  
Design of station lighting system  
Civil aspects covering yard levelling, controlling room, station drains, internal and approach roads, fencing, etc.  
Design of communication system for data transmission and protection covering PLCC and OPGW

### **Erection Commissioning and testing of sub stations**

Substation construction practices  
Salient features and types of Isolators with relative merits and O&M  
Testing, Commissioning and Maintenance of Power Transformers.  
Installation & maintenance of batteries & chargers

### **O&M and Condition monitoring Concepts**

O&M of Power Transformers  
Design aspects of High voltage circuit breakers; operational problems; maintenance practices and trouble shooting.  
Insulation coordination & selection of lightning arrestor  
Design aspects of instrument transformers; operation & maintenance (CTs, PTs & CVTs)  
Condition monitoring and life cycle enhancement of substation equipments

### **Protection aspects of EHT substations**

Salient features of substation protection systems and Earthing practices

### **Advance topics**

Gas Insulated Substations  
Substation Automation & SCADA

**Field Visit to a 400/220 KV SS and a Gas Insulation Substation, original equipment manufacturer**

### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** Working in Power Related Sector/Department/Ministry, Generation, Transmission or Distribution Companies/Utilities, Rural Electrification or Renewable Energy Department/Division

**AGE LIMIT:** 25 - 45 years



## 4. POWER PROJECT APPRAISALS, FINANCIAL MANAGEMENT AND ACCOUNTING STANDARDS

(From 18<sup>th</sup> Sept 2017 to 10<sup>th</sup> Nov 2017)

Duration: 8 Weeks

### AIM:

The basic challenge for the power sector is the paucity of funds for capital investment. The generation, transmission and distribution projects need huge capital and talented man power to keep pace with development. As financing is one the basic inputs for any capital intensive project and is complex in nature, the source of financing both short term and long term, need to be planned thoroughly and systematically. Transparency, efficiency and economy being three important factors in the operation of any company, finance and accounts will act as main pillar to make the project viable. Ultimately, finance and accounting is only the language of economic and transparent project appraisal. Therefore, a dynamic power company requires a vibrant and innovative financing and accounting system followed by unbiased audit.

### OBJECTIVE:

- Familiarize the participants with the technical issues in power sector, constraints and challenges
- Equip the participants on Sources and methods of financing, Project Formulation, Financial Appraisal and Monitoring of Power Projects
- Impart knowledge on accounting standards including IFRS

### CONTENTS OF THE COURSE:

#### Introduction to Power Sector

Power sector scenario in India and Organizational setup  
Electricity Act 2003 and National Electricity Policy  
Regulatory mechanism - India's & International experience, Issues and challenges

#### Financial Management of Power Companies

Institutional framework for financing of power sector in India  
Identification and formulation of different types of power projects  
Detailed Project Report (DPR) preparation and its components  
Investment appraisal including DCF & ERR techniques  
Cost of capital & Capital Budgeting  
Monitoring and evaluation of the power distribution projects  
Preparation of Annual Revenue Requirement (ARR)  
Value chain analysis & Life cycle costing  
Financial closure of the projects  
Project Management - PERT & CPM

#### Accounting Systems and Standards

Legal framework for Accounting and financial reporting  
Basic accounting principles and approaches  
Indian Accounting Principles and standards  
Issues in application of accounting standards  
International Financial Reporting Standards (IFRS)  
Financial ratios and key performance indicators  
Corporate Governance

Qualitative characteristics of financial information and financial statements  
Consolidated of financial statements  
Balance sheet analysis and profit & loss account  
Global practices and benchmarks  
Valuation of inventories, depreciation accounting  
Companies Act

### Commercial Aspects

Tariff policies and pricing  
Energy Audit and Accounting  
Metering, Billing and Collection  
Power Purchase Agreement  
Electricity Market, Trading & ABT

### Exercises & Case studies

Balance sheet analysis  
Investment appraisal

### Group Discussions

Comparison between Indian Accounting Standards and in participating countries  
Comparison between Indian Accounting Standards and IFRS  
Financial appraisal of a project

### Field Visits:

Financial Institutions  
Power Companies, Projects & Utilities

### ELIGIBILITY CRITERIA FOR PARTICIPANTS:

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** should be working in Power Related Sector/Department/Ministry/University/Transmission or Distribution Companies/Utilities, etc.

**AGE LIMIT:** 25 - 45 years



# 5. PLANNING AND MANAGEMENT OF POWER TRANSMISSION AND DISTRIBUTION SYSTEMS

(From 18<sup>th</sup> Sept 2017 to 10<sup>th</sup> Nov 2017) Duration: 8 Weeks

## AIM:

Power is a vital infrastructure for economic development. It is most capital intensive infrastructure, accelerating economic growth and achieving higher standards of living depend upon the availability of adequate and reliable power at an affordable price. To make power sector commercially sound and self-sustaining, efficient transmission and distribution management systems and adoption of modern technologies are fundamental. Obsolescence in design, construction practices and technologies, inadequate interregional transmission links will lead to poor quality, unreliable power supply, and high energy losses & inter regional imbalances. It has become, utmost important to review the existing practices & technologies adopted to optimize and modernize them, so as to supply electricity at affordable cost to all categories of consumers to help boost economic growth.

## OBJECTIVES:

- Impart knowledge on operation & maintenance of power Transmission & Distribution systems
- Orient the participants with the latest technologies, methods and equipment including IT applications in Power Transmission & Distribution
- Discuss about the commercial aspects of power transmission & distribution business

## CONTENTS OF THE COURSE:

### Introduction

Power scenario – Indian experience  
Organizational Structure of Power Sector in India  
Planning and designing of distribution system  
Role of Regulatory Commissions & Electricity Act, 2003

### Transmission System

Transmission System Planning in India  
Tower Design, Erection and Structural Details  
Technical and Economical aspects of Systems  
Interconnection  
Power Transmission by HVDC System  
Inter-System Power Exchange & ABT  
Maintenance of EHV-AC and HVDC Substation and Electrical Equipment  
Best practices in Grid management  
IT Application in Transmission system

### Distribution System

Standards, Specifications of materials and Construction practices  
O & M of Overhead lines and Sub-stations



Transformers – Installation and O & M & Failure Analysis  
Switchgear – Installation and Maintenance  
Adoption of Innovative and Cost Effective Technologies & Unmanned Sub-station  
Safety Measures and Prevention of Electrical Accidents  
Energy Efficiency and Maintenance Free Transformers  
Switched Capacitors & Reactive Power Compensation  
Integrated Distribution Planning for Loss Reduction and Voltage Improvement  
Gas Insulated Sub-stations (GIS) & Dissolved Gas Analysis of Transformers  
Power System Protection & Differential Relays  
Earthing System and Protection against Lightning, Surges and Transient  
Energy conservation in Agriculture, Domestic & Industrial Services  
HVDS – Control, Operation, Protection and Economics – Case Study  
DSM Tools & Techniques and its Methodology

### **Metering, Billing and Collection**

Introduction to Energy Meters – An Overview  
Specification of Energy Meters - Meter Seal, Testing and Calibration  
Meter Reading Instrument Technologies and Spot Billing  
Solid-state Electronic Meters and Automatic Meter Reading Equipment  
Recent Developments in Metering – Remote, Pre-paid, etc.

### **Commercial Aspects**

Tariff Structure, Billing and Accounting  
Technical and Legal Remedies to Control Theft of Energy  
Annual Revenue Requirement Calculations  
Power Distribution Franchising  
Energy Audit & Accounting  
Clean Development Mechanisms (CDMs)

### **Information Technology (IT)**

IT for Transmission and Distribution Management  
Management Information Systems (MIS) & Consumer Information System (CIS)  
Geographical Information Systems and Global Positioning Systems (GIS & GPS)  
SCADA Applications and Functions  
Customer Relation Management & Consumer Analysis Tools

### **Exercises**

Voltage Regulation Calculations for 33 KV, 11 KV and LT Lines  
Load Flow Study & Calculation of Line Losses

### **Group Discussions**

Measures to prevent Pilferage of Electricity & Line Losses  
Measures to prevent failure of Distribution Transformers

### **Local Field Visits:**

SCADA and Power Management Center, substations and original equipment manufacturer  
Gas Insulated Sub-station, Transformer & Meter Manufacturing Units

### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** should be working in Power Related Sector/Department/Ministry/  
University/Transmission or Distribution Companies/Utilities, etc.

**AGE LIMIT:** 25 - 45 years

## 6. BEST PRACTICES IN POWER DISTRIBUTION

(From 13<sup>th</sup> Nov 2017 to 15<sup>th</sup> Dec 2017)

Duration: 5 Weeks

### AIM:

Power distribution forms most crucial chain of the entire power business. If this segment is able to demonstrate commercial viability and maintain uninterrupted power supply to customer, there is every possibility that the entire power sector will yield positive results. The best technology application and practices will improve quality and reliability of power supply to customer besides, help in reduction of losses. Refurbishment of HV & LV Distribution system will increase customer satisfaction on the one hand and increase the revenue of the utility on the other. Therefore, there is urgent necessity to modernize and adopt best practices in power distribution sector.

### OBJECTIVES:

- Educate the participants on Standards of Performance and customer relation management and concepts in Power Distribution
- Impart knowledge on best operational and maintenance practices
- Orient the participants with the latest technologies and equipment including IT applications & distribution automation.



### CONTENTS OF THE COURSE:

#### Basics of Distribution

Power scenario of India and its Organizational Structure  
Planning and designing of distribution system  
Load Forecasting & Analysis  
Distribution Franchising

#### Construction, Operation & Maintenance of Distribution System

Specifications of materials and Construction standards  
O & M of Overhead lines and Sub-stations  
Distribution Transformers – Operation & Maintenance & Failure Analysis  
Indoor and Outdoor Switchgear – Installation and Maintenance  
Adoption of Innovative and Cost Effective Technologies & low cost 33/11 KV SS  
Safety Measures and Prevention of Electrical Accidents  
Switched Capacitors – HT & LT, Reactive Power Compensation  
Power System Protection & Relays  
Earthing System and Protection against Lightning, Surges and Transient  
Distribution Automation & SCADA

#### Energy Loss Reduction

Optimal Integrated Strategy for Loss Reduction and Voltage Improvement  
Energy Efficiency and Maintenance Free Distribution Transformers  
Pilferage & Theft of Energy  
Load management & Demand Side Management Techniques  
Energy Audit & Accounting  
HV Distribution System

### **Metering, Billing & Collection**

Electricity metering, billing & collection  
Metering Technologies & Advancements  
Recent Developments in Metering – Remote, Pre-paid & Pilfer Proof  
Meter Reading Instrument Technologies and Spot Billing

### **Power Quality & Customer Service**

Quality of service and Power Supply  
Standards of performance for power supply  
Customer Relation Management & Consumer Analysis Tools (CAT)  
SCADA & Integrated Customer Care Center

### **Information Technology (IT)**

IT for Distribution Management  
Management Information Systems (MIS) & Consumer Information System (CIS)  
Geographical Information Systems (GIS) and Global Positioning Systems (GPS)  
Smart Meter & Smart Grid  
Mobile/Electronic enabled Services

### **Exercises**

Voltage Regulation Calculations for 33 KV, 11 KV and LT Lines  
Calculation of Line Losses in Distribution  
System Improvement Schemes – Methodology  
Load Flow Study

### **Field Visits**

33/11 KV Substation & HVD Systems, equipment manufacturer  
Transformer & Meter Manufacturing Units

### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** Working in Power Related Sector/Department/Ministry,  
Generation, Transmission or Distribution Companies/Utilities, Rural Electrification or  
Renewable Energy Department/Division

**AGE LIMIT:** 25 - 45 years



# 7. MANAGEMENT OF POWER UTILITIES USING INFORMATION TECHNOLOGY ICT / AUTOMATED SOLUTIONS

(From 13<sup>th</sup> Nov 2017 to 15<sup>th</sup> Dec 2017)

Duration: 5 weeks

## AIM:

Information Technologies (ITs) are widely acknowledged to be crucial for efficient operation and management of the power utilities, which need to handle a large amount of information for their efficient operation and maintenance. The entire gamut of the operation in power sector is revolving around availability of quality power and efficient management of energy while maintaining the eco-friendliness, bringing about standardization and transparency.

Power utilities are making major gains in terms of productivity, efficiency, reliability and commercial management through the use of modern Information and Communication Technology tools (ICTs) for improvement in load management, strengthening of metering, billing and collection avenues, enhancement of attention towards the quality of electricity supply and customer care, etc.

The program offers a unique platform to learn, discuss and exchange experience about the major structural, technical, managerial & regulatory changes in IT & automation applications.

## OBJECTIVES:

- Build awareness among the Power Utility on the need and importance of Management Information Systems (MIS) and IT based solutions in Power Business
- To enable utilities to operate in an integrated environment avoiding unnecessary duplication of data and effort.
- Equip engineers and managers to pursue IT based approaches for improvement in management efficiency and customer services and enlighten with good case studies for adopting IT based solutions
- To orient the concepts and design of GIS and its applications in Power System planning, analysis and Asset management

## CONTENTS OF THE COURSE:

### Introduction

Power scenario – Indian experience  
Organizational Structure of Power Sector in India  
Planning and designing of distribution system  
Role of Regulatory Commissions & Electricity Act, 2003

### Basics of Distribution

Power scenario of India and its Organizational Structure  
Planning and designing of distribution system  
Load Forecasting & Analysis  
Distribution Automation & SCADA  
Distribution Franchising





### **Challenges in Electricity Distribution Sector**

Energy Efficiency and Maintenance Free Distribution Transformers  
Pilferage & Theft of Energy  
Load management & Demand Side Management Techniques  
Energy Audit & Accounting  
HV Distribution System  
Electricity metering, billing & collection  
Metering Technologies & Advancements  
Recent Developments in Metering – Remote, Pre-paid & Pilfer Proof  
Meter Reading Instrument Technologies and Spot Billing

### **Power Quality & Customer Service**

Quality of service and Power Supply  
Standards of performance for power supply  
Customer Relation Management & Consumer Analysis Tools (CAT)  
SCADA & Integrated Customer Care Center

### **Advance Topics in Power Sector Management**

Application of Information Technology in Power Sector  
New Initiatives & Government Programs and policies  
Transformation of Power Utilities - Roadmap  
Status of IT Applications in National and International Power Sector Arena  
Benefits of implementing IT Solutions  
MIS Concepts and Development  
Enterprise Wide Applications  
Enterprise Resource Planning (ERP) in Utilities  
Trends and Developments in Technologies  
Energy Management Systems (EMS)  
Distribution Automation (DA) Systems  
Power Plant Control Systems

### **Role of Information Technology (IT) in Power Sector**

IT in Distribution covering Performance Improvement, Asset & System Management  
Smart Metering, AMI, AMR, Revenue Protection, Metering & Billing, CRM, Energy Audit  
Call Centres - Trouble Call Management  
Geographical Information Systems (GIS) and Global Positioning Systems (GPS) based mapping system for power supply network  
Equipment management information system  
Communication technologies, including PLC and protocols, standards  
Trends in Wireless Technology  
Remote Monitoring & Wireless Control  
Planning and Energy Accounting Systems  
SCADA Applications in Power  
Smart-Grids  
Security measures and Compliance for IT Processes  
Regulators / System operators  
On-site demo-presentations  
Hands-on experience & Simulation Exercises

### **Field Visits to IT enabled Power Utilities**

## ELIGIBILITY CRITERIA FOR PARTICIPANTS:

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering or Computer Science/ Information Technology/MIS or equivalent

**WORK EXPERIENCE:** Should be Working in Power Sector/Energy Related Organizations and having IT and It implementation knowledge

**AGE LIMIT:** 25- 45 years



## 8. CERTIFICATE COURSE IN ELECTRICAL POWER MANAGEMENT

(From 08<sup>th</sup> Jan 2018 to 30<sup>th</sup> Mar 2018)

Duration: 12 weeks

### AIM:

Power is a critical infrastructure for development of any nation. The socio-economic development and life-style of citizens depends on availability of power. The availability and quality of power supply depends on proper planning, designing, use of latest technologies and practices for effective and efficient management of the system. It has become, utmost important to review the existing practices & technologies adopted to optimize and modernize them, so as to supply electricity at affordable cost to all categories of consumers to help bolster economic growth. The entire gamut of power management, i.e., generation, transmission, distribution, financial aspects, accounting practices and general management aspects will be dealt in the course.

### OBJECTIVE:

- Impart knowledge on planning, designing and operation & maintenance of power sector systems
- Orient the participants with the latest equipments and technologies of the power sector
- Discuss about energy accounting, auditing and management aspects for efficient management of power business.

### CONTENTS OF THE COURSE:

#### Introduction to Power Sector (2 Week)

Overview of Power scenario & Indian experience  
Organizational Structure of Power Sector in India  
Restructuring & Power Sector Reforms, Electricity Act, 2003  
Role of Regulatory Commissions in India & International experiences  
National Electricity Policy, Rural Electrification Policy and Tariff policy  
Open Access and trading in power

#### Power Generation Management (2 Weeks)

Planning and Designing of power generation projects  
Types of generation projects (Thermal, Gas Atomic and Hydro power Plants)  
Economics of Power generation under various options  
O & M of power generation projects  
Renovation and Modernization of Generation Projects  
New and Renewable energy sources – Solar, Wind, Biomass/Municipal Waste, etc.  
Automation for efficient management of power plants  
CERC Norms for power generation and project completion  
Energy conservation in Power plants  
Control systems and protection including Generator protection  
Fixation of generation Tariff under cost plus method and competitive bidding

### **Transmission Systems Planning and Management (2 Weeks)**

Transmission System Planning

Tower Design, Erection and Structural Details

Transmission line materials, Tower erection, Line stringing and commissioning

Technical and Economical aspects of Systems Interconnection

Electric Power Transmission by HVDC System

Inter-System Power Exchange & ABT

Maintenance of EHV- AC and HVDC Substation and Electrical Equipment

Best practices in Grid management

Gas Insulated Sub-stations (GIS)

Bus-bar arrangements and design

Power System Protection

Power Transformers – Erection, Testing, Commissioning and O & M

SCADA Applications & Functions

Design of substation structures, erection and testing and commissioning of a substation

Transmission and SLDC tariff fixation

Reactive power management

Communication systems and OPGW

### **Distribution Systems Planning and Management (2 Weeks)**

Load forecasting, planning and designing of distribution system

Integrated Distribution Planning for Loss Reduction and Voltage Improvement

Standards, Specifications of materials and Construction practices

O & M of Overhead lines and Sub-stations

Distribution Transformers – Installation and O & M

Switchgear – Installation and Maintenance

Adoption of Innovative and Cost Effective Technologies & Unmanned Sub-station

Switched Capacitors & Reactive Power Compensation

Earthing System and Protection against Lightning, Surges and Transient Over voltages

Energy Meters and its technologies

DSM Tools & Techniques and its Methodology

HVDS – Control, Operation, Protection and Economics – Case Study

Energy Audit & Accounting

Safety practices and Disaster management

### **Information Technology for Power Sector (3 Days)**

IT for Transmission and Distribution Management

Management Information Systems (MIS) & Consumer Information System (CIS)

Geographical Information Systems and Global Positioning Systems (GIS & GPS)

Customer Relation Management & Consumer Analysis Tools

Distribution Automation and SCADA

Smart grid formation

### **Financial and Accounting Systems for Power Sector (3 Days)**

Detailed Project Report preparation for Power Projects

Appraisal of Power Projects

Monitoring and Evaluation of Power Projects

Performance Evaluation by Ratio Analysis

Tariff Structure, Billing and Accounting  
Financial appraisal of power projects  
Cost of Capital and Capital Budgeting Decisions  
Budgeting and Budgeting Techniques  
Accounting Principles and Policies  
Principles and Practices of Cost Accounting  
Project Management & Accounting

### **General Management (3 Days)**

Communication skills  
Positive Attitude and Thinking  
Exploring Self and Personality Development  
Motivation and team building  
Stress Management

### **Project Work (3 days)**

Each participant has to submit a detailed project report on one of the aspects of the training or its applications, alternatively a lingering problem of their country can be discussed suggesting solutions from the topics learnt in the training, and the project report shall be exhaustive with diagrams and illustrations. Where required, the participant can visit certain offices or sites for collecting data or photographs and these expenses can be claimed subject to the maximum limit fixed for the Project allowance. The prepared project will be presented before the panel of Faculties who will assess the reports and suggest for additions or deletions, if any for refinement of the Report.



### **Field Visits (2 Weeks)**

Visit to Generating Plants  
Visit to Transmission Sub-Station  
Visit to SCADA Center and Load Dispatch Centre  
Visit to Manufacturing Units like, Transformer, Switchgear, Capacitors, Meters, etc.

### **ELIGIBILITY CRITERIA FOR PARTICIPANTS:**

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** Should be Working in Power Sector/Energy Related Organizations and having IT and It implementation knowledge

**AGE LIMIT:** 25- 45 years

## 9. TRENDS IN ELECTRICAL POWER GENERATION

(From 05<sup>th</sup> Mar 2018 to 30<sup>th</sup> Mar 2018)

Duration: 4 Weeks

### AIM:

Power generation and Transmission form the vital segment in the power supply chain to facilitate supply meeting the demand. Huge costs and high risks involved due to dealing with high voltages require cost effective procurements and safe, economical & efficient erection, operation & maintenance practices. Planning, execution and operation of generating and transmission systems, thus acquire highest significance in the extension of power supply of quality at affordable price at least losses. The course is designed to create necessary awareness.

### OBJECTIVE:

- Impart knowledge on operation & maintenance of power generation systems.
- Orient the participants with the latest technologies, methods and equipment including IT and automation applications in Power generation.
- Discuss about the commercial aspects of power generation
- Energy auditing, accounting and conservation in power generation

### CONTENTS OF THE COURSE:

#### Introduction

Electricity Act 2003, National Electricity Policy 2005 and its background,  
Challenges in Electricity generations,  
Overview of conventional generation, processes and way ahead

#### Planning of generation

Load forecast on long term basis and arriving at annual energy and peak demands and fixing of LoLP (loss of load probability) and USE (un-served energy) targets using computer techniques

Fuel Linkages and its Issues

Comprehensive Generation Planning up to unit level considering limits fixed for LoLP

Power system studies relevant to alternative sites proposed and selecting the location of a power plant

Salient features of Erection & Commissioning of Generating stations (Thermal and Gas power plants including ultra-mega power projects and Power Plants operating on renewable energy sources)

Preparation of Detailed Project Reports for generation projects

#### Operation and Maintenance of Power Plants

Erection, Commissioning and Operation of Thermal, Hydel and Renewable Power Plants

Operation and maintenance aspects of gas and thermal stations and Power Plants operating on renewable energy sources

## Performance and Efficiency issues

Ways and means to improve plant load factor and efficiency

Renovation & Modernization of generating plants

Protection systems in generating stations

RLA and R&M of Power Plants

Energy Auditing in generating stations and reduction of auxiliary consumption

## Field visits:

Thermal/Gas Power Generating stations

## ELIGIBILITY CRITERIA FOR PARTICIPANTS:

**EDUCATIONAL:** Diploma/Degree in Electrical Engineering

**WORK EXPERIENCE:** Working in Power Related Sector/Department/Ministry, Generation, Transmission or Distribution Companies/Utilities, Rural Electrification or Renewable Energy Department/Division

**AGE LIMIT:** 25 - 45 years



## GENERAL INFORMATION:

### METHODOLOGY

The training approach and tools deployed are typically interactive besides facilitating participative learning. Discipline-specific background theme papers as material set the tone for introspective learning. Lecture-cum-discussions, case studies form major tools. Inclusion of field study visits and in-plant studies in the curriculum ensures an appropriate mix of theory with practice. Renowned subject experts and experienced field level functionaries form the core source faculty.

### MEDIUM OF INSTRUCTION

The medium of instruction is English. Adequate knowledge of English is necessary for effective participation in the program. The participants are expected to be proficient in English and must satisfy the Indian Mission about their proficiency in English as well as health to travel widely.

### FIELD VISITS AND STUDY TOUR

Participants will be taken on field visits and study tour for about ten days to various organizations/places in and outside Hyderabad.

### PROJECT REPORT

Each participant should prepare one project report on the subject of his choice in power sector which will be identified in the second week of the course. The aim of the project report is to indicate as to how the knowledge acquired would be utilized in his/her background situation. Study tour and local visits will be designed to suit the requirement of the training program. During the last week of the program, the participants will present project reports prepared in the presence of faculty dealing with the subject.

### MATERIAL FOR EXCHANGE OF INFORMATION

For effective and purposeful contribution to discussions among the participating countries, each participant is required to bring with him/her the following information/items applicable to his/her country:

- Basic data about policies, programs and their status
- Information about the support institute/organization/agencies for promoting and developing power sector
- National Flags (one in smaller size for table purpose and the other in normal size)
- Participants are also advised to bring with them their costumes, audiovisuals, materials, which they wish to share with their fellow participants in seminars, cultural evenings, other social occasions, etc.

### CERTIFICATE

Each participant will be given a certificate on successful completion of course and having satisfactory record of attendance.

### FELLOWSHIP AND STIPENDS

CIRE by itself does not fund participation in any of the international programmes.

The assistance offered through Government of India Fellowships is made available under:

- Indian Technical and Economic Cooperation (ITEC)
- Special Commonwealth African Assistance Plans (SCAAP)



Certificate Distribution to the participants of International Training Programme on "Latest Trends in Thermal Power Generation"



For details regarding fellowship are available from the Govt. of India website. Intending applicants or their organizations may contact the High Commission / Embassy of India accredited to the country. The sponsoring Governments are required to pay their nominees' supplementary allowance to meet personal expenses during training as per their respective levels and practices. The sponsoring government may also have to pay to meet the transit expenses, etc., that will be incurred by the nominee.

### **VISA**

Before coming to India the participants should obtain a valid visa for the period of programmes from the Indian Mission. Immediately after the completion of the programmes, the participants are required to go back to their own countries and cannot travel to any other destination.

### **EXCESS BAGGAGE**

Participants attending programmes through Government of India Fellowships should ensure the excess baggage coupons/voucher as admissible under the fellowship while collecting their tickets from the respective Indian Missions.

### **SELECTION**

The Government of India along with CIRE will select the participants from the applications received. After the selection has been made, the same would be intimated by fax/e-mail to the concerned Indian Mission, who could confirm the candidate's agreement by return fax/e-mail.

### **ACCOMMODATION**

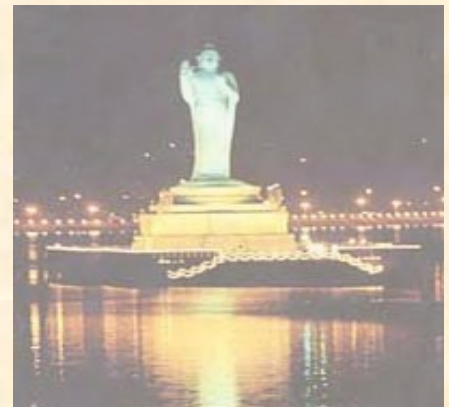
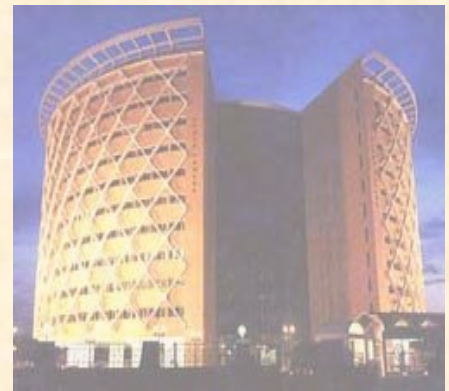
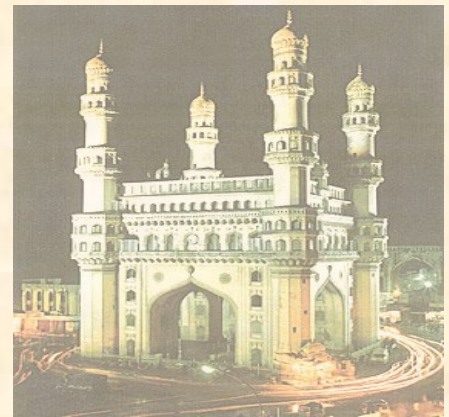
Air conditioned hostel accommodation on single/double occupancy basis will be made by CIRE on receipt of advance intimation.

### **SUNDRY**

Participants are advised to carry private funds to cover expenses for the contingencies and enforced halts, long distance telephone calls, sightseeing, etc. The Government of India fellowship by its nature does not cover such contingencies. From their entitled living allowance of Rs.25,000/- per month paid by the Government of India, amount will be collected from the participants towards boarding at CIRE. As the fellowship under Government of India may not suffice to meet expenses on special dietary needs and shopping etc., nominees are advised to bring extra foreign exchange.

### **CLIMATE**

The Hyderabad city situated in the Deccan Plateau has varied climatic conditions. During July to November, the maximum temperature ranges from 20°-30°C. December and January are cold with night time lows of 12°C. During the months of February and March, the maximum temperature varies between 25°-35°C.



## ABOUT THE HYDERABAD CITY

Hyderabad, the capital of Andhra Pradesh State, is a picturesque sprawling city located about 1700 kms south of New Delhi, India's capital and nearly 800 kms to east of Mumbai, the business capital of India. It is situated at an elevation of 540 metres above the sea level and enjoys pleasant climate almost throughout the year. The city has many majestic historical monuments, mosques and marvelous minarets and palaces.

The ancient city of Hyderabad was ruled by Nizam who was fascinated for pearls and attracted traders/craftsmen to bring the best to this land. It is, therefore, is also known as pearl city. It is famous for Silver inlay work, popularly known as Bidri Ware. The world famous monument Charminar – an imposing structure with 53 metres high – is an attraction of the city. On the western outskirts of the city, the historical Golconda Fort is located.

The Salar Jung Museum, the world's largest one-man collection, displays around 35,000 antiques and art objects. The Asia's biggest Film City i.e. Ramoji Film City is located about 30 kms away from city. The city also has one of the world's largest monolith statues of Lord Buddha, the incarnation of peace in the middle of HussainSagar Lake. Magnificent Cyber Towers, housing IT companies symbolizes the grand entry of IT era in Hyderabad City.

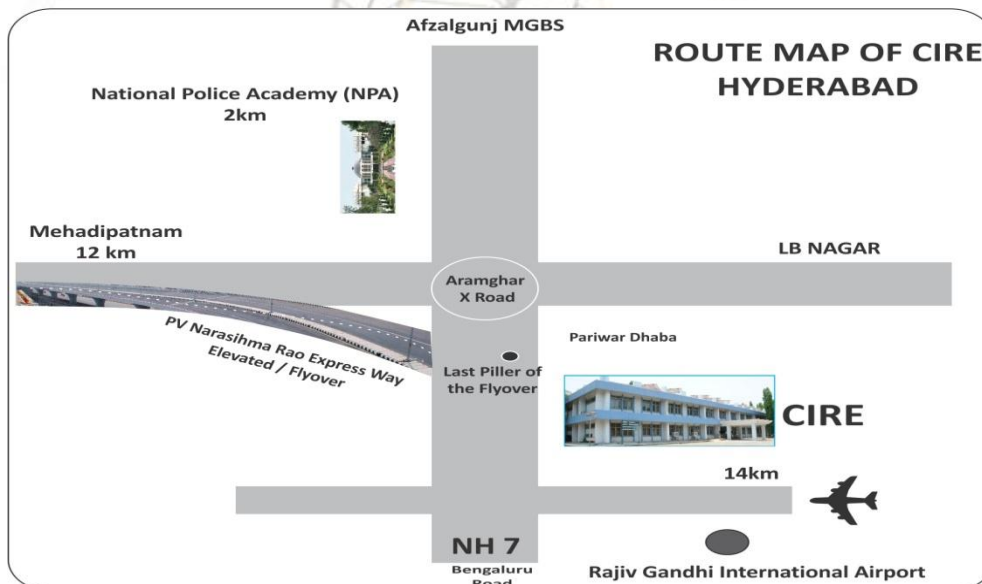
## CIRE – VENUE & LOCATION

The programmes will be organized at CIRE campus, NPA Post, Shivarampally, Hyderabad - 500052, Andhra Pradesh, India, located on the National Highway No.7, which is about 16 Kms away from the new Rajiv Gandhi International Airport (Shamsabad).

**Landmark: ARAMGARH CIRCLE (at the right side of the PVNR Expressway Flyover entry point)**

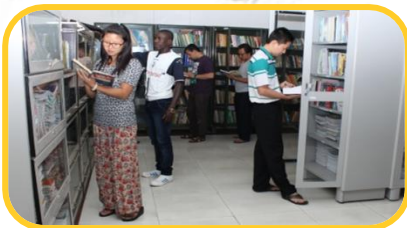
## REACHING CIRE

Participants will be received at the airport if a request is made in advance indicating confirmed arrival timings. However, pre-paid/metered cab/taxi service facilities are also available from Airport to the Institute.



## FACILITIES

The sprawling complex of CIRE is spread over an area of around 15 acres with Administrative, Teaching and Hostel block (Hall of Residence). The Hostel Block has got 38 air-conditioned rooms and air-conditioned dining hall. The Institute has latest teaching aids as well as full-fledged Computers lab and Internet facilities. Indoor games like Table Tennis, Chess and Caroms are available. A Jogging Track of 1 km length, Shuttle court and a Mini Gym is also available.



## LIBRARY

CIRE Library is one of the specialized centers with more than 4000 books and reference materials on the subjects like generation, transmission & distribution, energy efficiency and conservation, construction standards and specifications, management and information technology, electricity rules and laws, reforms and restructuring in power sector, etc. It subscribes to selected national and international journals on energy and power sector which caters to the information needs of the participants, in-house faculty and guest faculty for which the library uses e-grandhalaya software for easy reference and accessible of all books available in the library.

## ENERGY PARK

An Energy Park equipped with 40 kWp Roof top solar PV system to partly meet the energy need of institute, 5 kWp Solar Photo Voltaic Water Pumping System, 1kWp Solar Photo Voltaic Street Lighting System along with Solar Water Heating System, Solar Photo Lantern, 4 KW Wind Energy System and HVDS Resource Centre exists at campus for demonstration.



**FOR FURTHER INFORMATION PLEASE CONTACT**

**G SHANKAR  
ADDITIONAL DIRECTOR**



**CENTRAL INSTITUTE FOR RURAL ELECTRIFICATION  
Of**

**RURAL ELECTRIFICATION CORPORATION LIMITED  
(A Government of India Enterprise)**

**Shivarampally, NPA Post, Hyderabad - 500 052**

**Office Phones: 040-29805901, 29805897 Hostel: 040- 29807252**

**Fax: 040-2980-5896, E-mail: [cire@recl.in](mailto:cire@recl.in) & [cire.rec@gmail.com](mailto:cire.rec@gmail.com)**

**Website: [www.cirerec.com](http://www.cirerec.com)**

**Promotes Training for Better Tomorrow**