प्रशिक्षण कैलेंडर
TRAINING CALENDAR
2024-25

सत्यमेव जयते

Ministry of Power
Government of India
www.powermin.nic.in

एन पी टी आई
NPTI
प्रावीण्यं परोपवृत्तिश्च

NATIONAL POWER TRAINING INSTITUTE

Ministry of Power, Government of India
NPTI Corporate Office, NPTI Complex, Sector - 33, Faridabad - 121003, India
www.npti.gov.in

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OUR SOURCE OF INSPIRATION

"Energy sector plays a big role in the progress of the country and contributes to both ease of living and ease of doing business"

Sh. Narendra Modi
Hon'ble Prime Minister of India

OUR SOURCE OF VISION

Sh. Manohar Lal
Hon'ble Cabinet Minister of Power and Housing & Urban Affairs
Govt. of India

OUR SOURCE OF MOTIVATION

Sh. Shripad Yesso Naik
Hon'ble Minister of State in the Ministry of Power and New & Renewable Energy
Govt. of India

GOVERNING COUNCIL

Sh. Pankaj Agarwal
Secretary, Ministry of Power
Chairman, Governing Council

Sh. Ghanshyam Prasad
Chairperson, CEA
Vice-Chairman, Governing Council

Sh. Sanjeet
Joint Secretary & Financial Adviser
Ministry of Power, Permanent Member

Sh. Ajay Tewari
Additional Secretary
Ministry of Power, Permanent Member

Sh. Rakesh Kumar
Joint Director (T&R/P&P)
Ministry of Power

Dr. Tripta Thakur
Director General, NPTI
Member Secretary, Governing Council

Note : Besides there are 16 more members from various organizations

Our Attitude

We constantly strive to motivate every power professional to tap his unique human endowments, consciousness, imagination and willpower. Together we make a difference

Enhancing human and organizational excellence in Power and Energy sectors by blending frontier clean energy technologies to achieve economy and energy security

Our Mission

Our Vision

To be the Global Centre of Excellence for Training and Skill Development in Power & Energy Sectors

We value our drive and commitment to provide cutting edge technologies and top quality service to our clients, sharing our knowledge and caring for their needs

Our Values

FOREWORD

NPTI as an Apex Body under the Ministry of Power, remains committed to serving our nation with unwavering dedication and has been a cornerstone in shaping the landscape of Power Sector professionals over the past five decades. Having successfully trained over 4,70,000 Power Professionals through regular programs, NPTI stands at the forefront of providing specialized training in the dynamic fields of Power and Renewable Energy. The Ministry has entrusted us with the vital responsibility of training and capacity building for state DISCOMs employees under the Revamped Distribution Sector Scheme (RDSS), a role we undertake with utmost diligence. In response to the evolving needs of the power sector, NPTI has proactively embraced challenges such as the implementation of smart distribution infrastructure, efficient operation of DISCOMs under RDSS, and the imperative role of cybersecurity in the power sector. We take pride in conducting comprehensive training and certification courses in compliance to the provision of the CEA (Cyber Security in Power Sector) Guidelines, 2021, to address cybersecurity concerns at various levels. As part of the Ministry's vision to impart a 360-degree training for budding professional in power sector, 3-week foundation program is being conducted for new recruits of CPSUs and autonomous institutions to train professionals well-versed in every facet of the power sector. NPTI is also an institutional partner for WePOWER, an initiative by the South Asia Gender and Energy Facility (SAGE) at the World Bank, which aims to support women's participation in energy projects and institutions in the South Asian region.

Beyond our core mission of strengthening Generation, Transmission, and Distribution infrastructure, NPTI actively contributes to initiatives aimed at various pathways for energy transition. Under the "Mission Samarth" program, NPTI has been organizing training cum awareness initiatives for farmers and pellet manufacturers, encouraging the utilization of farm stubble in biomass pellet formation for coal-fired thermal power plants. To ensure our participants stay abreast of the latest technologies, we continuously upgrade our infrastructure and training facilities. NPTI has hi-tech real time simulators of various power plant capacities, which include thermal (Supercritical, Subcritical), Multifunctional, CCGT, Hydro, SCADA & Smart Grid Operations and Dispatcher Training Simulator. Our training institutes, strategically located across the country, not only conduct on-site programs but also offer online and offline training options.

NPTI is conducting courses on emerging disruptive technologies in the power sector and also coming up with consultancy and centre for excellence in SCADA, Hydro, Cyber Security and energy transition. NPTI is partnering with the Madhya Pradesh Skill Development Project (Govt. of Madhya Pradesh) and Global Skills Park (Govt. of Madhya Pradesh) to set up Centre of Excellence for upskilling students, trainees, DISCOMs employees, and power sector professionals in the areas of Energy Transition, Smart Metering, AMI, SCADA, Data Analytics etc. A cutting-edge National SCADA Resource Centre (NSRC) is also coming up at Faridabad to give hands-on training on forthcoming distribution SCADA in various DISCOMs across India. A state-of-the-art training infrastructure for Hydro/Pumped Storage to cater to the upcoming skilled manpower requirement in hydro and Pumped storage plants is also envisaged.

The refinement of our course curriculum and training programs is an ongoing process, driven by valuable input from our Advisory Board members and continuous feedback from participants. This ensures that we not only meet but exceed the expectations of our trainees and address the dynamic requirements of the Power Sector as a whole. Publications in areas related to the operation and maintenance of Thermal, Hydro, Gas Power Plants, Renewable Energy, and Transmission & Distribution systems are integral to our commitment to knowledge dissemination. These publications not only benefit our trainees but are also extended to other client organizations, fostering a culture of continuous learning and innovation.

Dr. Tripta Thakur
Director General, NPTI, Ministry of Power, Govt. of India

TOGETHER IN PURSUIT OF EXCELLENCE

LOCATIONS

एन पी टी आई
NPTI
प्रावीण्यं परोपवृत्तिश्च


NPTI (NR) BADARPUR


NPTI (HPTC) NANGAL


NPTI SHIVPURI MADHYA PRADESH


NPTI (ER) DURGAPUR


NPTI (NER) GUWAHATI

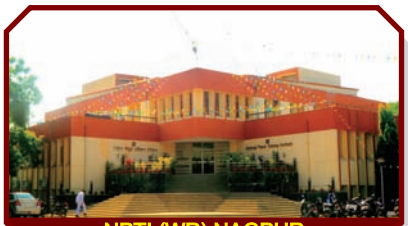

NPTI (CO) FARIDABAD


NPTI (HLTC) BENGALURU


NPTI (PSTI) BENGALURU


NPTI (SR) NEYVELI


NPTI ALAPPUZHA KERALA


NPTI (WR) NAGPUR

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Dr. Tripta Thakur, Director General, NPTI cordially felicitating Shri R. K. Singh, Hon'ble Cabinet Minister of Power and New & Renewable Energy, during the WePower Women Indian Ambassadors meet at Shram Shakti Bhawan, New Delhi

DG, NPTI receiving the "NTPC Rajbhasha Shield" and Patronage letter from Hon'ble Minister for Power and New & Renewable Energy, Shri R. K. Singh during the Hindi Advisory Committee meeting of the Ministry of Power

1. ABOUT NPTI

1.1 ABOUT NPTI

The National Power Training Institute (NPTI), an ISO 9001:2015 and ISO 14001:2015 organization under the Ministry of Power, Govt. of India, is the National Apex body for Training and Human Resources Development in the Power Sector and the world's leading integrated Power Training Institute, with its Corporate Office at Faridabad. NPTI operates on a pan-India basis through its Eleven institutes. Apart from highly skilled and competent trainers and State-of-the-art laboratories, NPTI has Hi-tech real time simulators of various power plant capacities at its institutes, which include thermal (Supercritical, Subcritical), multifunctional, CCGT, Hydro, SCADA and Smart Grid Operations and Dispatcher Training Simulator. Having trained more than 4,70,000 Power Professionals in various training programs over the last 5 decades, NPTI is the only institute of its kind in the world with such a wide geographical spread, covering a wide gamut of training programs in Renewable Energy and Power Sector.

NPTI is recognized as the Cadre Training Institute for the officers of Central Electricity Authority.

NPTI operates on an all-India basis through its 11 institutes with a manpower strength of 149, including 78 officers. The region-wise institute list is given below:

Northern Region

1. NPTI Corporate Office, Faridabad
2. NPTI (Northern Region) Badarpur, New Delhi
3. NPTI (Hydro Power Training Centre), Nangal

Southern Region

4. NPTI (Power System Training Institute), Bengaluru
5. NPTI (Hot Line Training Centre), Bengaluru
6. NPTI (Southern Region), Neyveli
7. NPTI, Alappuzha

Eastern & North Eastern Region

8. NPTI (Eastern Region), Durgapur
9. NPTI (North Eastern Region), Guwahati

Western Region

10. NPTI (Western Region), Nagpur
11. NPTI, Shivpuri

1.2 MAIN OBJECTIVES

- To function as a National Organization for training in the fields of (a) Operation and Maintenance of Power Plants, and (b) All other aspects of Electrical Energy Systems including transmission, sub-transmission and distribution.
- To act as the Apex body for initiating and coordinating training programs in the power sector of the country.
- To establish and run training institutes for Engineers, Operators, Technicians and other personnel of the Power Sector.

DG, NPTI welcomes Sh. Pankaj Agarwal, IAS, Secretary (Power), Ministry of Power during the inaugural ceremony of Induction Training Program of MSETCL, conducted at NPTI Faridabad

2. TRAINING AT A GLANCE

2.1 TRAINING AT A GLANCE

NPTI conducts long-term, medium-term and short-term Training Programs for Engineers, Supervisors and other professionals on various technical and managerment topics pertaining to the Renewable Energy and Power Sector in the areas of Thermal, Hydro, Renewable, Transmission and Distribution, Management, Regulatory Affairs etc. The training programs conducted by NPTI are either regular or customized to suit the training needs of the client organizations. These programs are being organized round the year along with Workshops and Seminars on latest developments in the Sector.

To achieve the objective of providing energy sector training, the training methodology adopted creates a step-by-step environment for the all-round development of skills and knowledge of the participants.

- Classroom lectures for imparting formal, theoretical and technical knowledge
- Case studies/Group discussions
- Self-learning techniques, like computer based self-learning training packages and e-learning
- Practical hands-on training in corrective maintenance methods and techniques
- Simulation techniques and on-job training in Power Stations/Power Systems
- Industry Interfaced Programs and Placement of Students

2.2 INDUSTRY INTERFACED PROGRAMS

NPTI conducts various industry interfaced programs which includes post graduate diploma courses along with the flagship MBA program in Power Management. All these industry interfaced programs are aimed to create a pool of committed and competent professionals equipped with appropriate technical skills to steer the Indian Power Sector.

Two-year regular MBA program in power management is targeted towards fresh and practicing graduates. In addition to the inputs provided in other MBA programs, this particular Program with a difference lends special emphasis on specific Power Sector issues, Sustainability, Data analytics and data sciences, Cyber security and cloud management. The course is duly recognized by AICTE and affiliated to J.C Bose University of Science and Technology (YMCA), Faridabad. This MBA course is open for graduates with any discipline.

Post Graduate Diploma Courses (PGDC) have been designed to meet the increasing need to

Inauguration of One-week capacity building program for 8 NER States by Smt. Nandita Garlosa, Hon'ble Minister of Power, Cooperation, Mines, Minerals, Indigenious and Tribal faith and Culture, Govt of Assam in the presence of Sh Ajay Tewari, IAS, Addl. Secretary, MoP, GoI and Dr. Tripta Thakur, DG, NPTI

Mid-career training program conducted by NPTI at LBSNAA, Mussoorie, from 24th to 28th July, 2023

keep the academia abreast of the skill set requirement of the energy industry. These job-oriented courses are charted with a proper balance of theory and practical learning, so that the students get enough hands-on experience which will enable them for readily absorption into the Sector. The curriculum of courses enables graduate engineers/working engineers to enhance their skills and to get an exposure to industrial standards & practices.

PGDC and Post Diploma Courses (PDC) spans from Six months to One year. PGDC programs include specialization in Power Plant Engineering, RE & Grid Interface Technologies, Hydro Power Plant Engineering, T&D System, Cyber Security, Power Distribution & Emerging Technologies etc and Post Diploma Course in Thermal Power Engineering, Hydro Power Plant Engineering etc.

For more details on course contents, fee, duration etc., please refer NPTI website and concerned course advertisements.

NPTI also offers Internship programs on a pan-India basis for students pursuing B.Tech./B.E./ B.Sc (Engineering)/Diploma (Engineering) degrees.

Our students of PGDC and PDC have been recruited by reputed companies. For the list of recruiter companies, kindly refer the section “Clientele and Recruiters”.

2.3 INDUCTION TRAINING

NPTI has been imparting induction training to fresh Graduate Engineers/Executives from various organizations of Power Sector such as CEA, Grid-India, OHPC, NHPC, MSETCL, DVC,

Batch of 156 Assistant Engineers of MSETCL, along with NPTI officials, during their 9-week induction level training program conducted by NPTI, Faridabad.

Sh. S. Suresh Kumar, IAS, Chairman, DVC along with DG, NPTI, during the inauguration of 52 weeks Induction training program for 112 Graduate Engineers Trainees (GETs) of DVC

MPPGCL, UPRVUNL, RRUVNL, etc. In the academic year 2023-24, NPTI Faridabad has conducted several such programs which includes Nine-weeks induction level training program for 157 assistant engineers of MSETCL from 28th August to 27th October 2023, Induction cum orientation program of 4-week duration for four batches of ETs /TOs of NHPC, Two batches of Induction-level training program for ETs of Grid-India and 14-Week Residential Induction Training Program on "O&M of Thermal Power Plant" for Assistant Engineers (T-E&M) of UPRVUNL etc. Various induction-level training programs are conducted at regional centers of NPTI as well. NPTI, Durgapur has conducted Induction Training For Graduate Engineers (GETs) OF DVC for 52 weeks in which a total of 112 Graduate Engineers Trainees (GETs) of DVC. NPTI, Guwahati has also conducted induction training of Nine-week duration for the participants from Assam Power GenCo.

2.4 MID-CAREER TRAINING

Being the apex training body under the ministry of power, NPTI imparts Mid-Career training programs for IAS officers, CPES officers (CEA), Officers of CPSUs, Officers of Ministry of Power etc.

Mid-Career Training Program for IAS Officers

NPTI conducted mid-career Training Programs/ workshops on energy/power modules for IAS Officers at LBSNAA, Mussoorie.

During December 2022, NPTI conducted the "ENERGY" module of one week duration, as a part of the four-week mid career Phase III training program for IAS officers. A wide range of topics covering generation, transmission and distribution sectors were presented to the participants. New and emerging technologies in the power sector were also introduced.

In May 2023, NPTI has organized a Two Days module on "Energy" as part of the 17th Round of Phase IV, Mid-Career Training Program.

In July 2023, a five days training workshop in the Energy Sector under Mid-Career Training Program (for IAS & other officers recently posted in the Energy Sector) has been organized.

One-week Mid-Career training program for Directors of Central Electricity Authority, held at NPTI Faridabad

Director General, NPTI honouring Sh. S. R. Narasimhan, Chairman and Managing Director, Grid Controller of India during the inaugural ceremony of Induction Training Program for ETs of Grid-India

Mid - Career Training Program for CPES Officers of CEA

NPTI has conducted mid-career training programs for 6 batches of Deputy Directors and 2 batches of Directors from Central Electricity authority. The training modules were techno-managerial. The objective of the training was to update the participants with recent developments in Power Sector along with exposure to different managerial skills.

One week Training Program for MoP Officials

NPTI conducts one-week training programs on Recent trends in power sector for the officials of MoP. The aim of the program is to give an overview on the generation, transmission, distribution systems with emphasis on state of the art technology and regulatory aspects. NPTI Faridabad has conducted two such training programs in the month of February and March 2024.

General Management Program for Power Finance Corporation

NPTI, Faridabad has conducted the General Management Program I, II and III for the Managers, Chief Managers and Deputy General Managers of Power Finance Corporation during July,2023. A total of 56 participants have attended the training program.

2.5 MANDATORY FOUNDATION PROGRAM

Foundation Program, a three-week course, has been designed to train the power sector professionals so that they have interdisciplinary

Trainees of 18th batch of Mandatory Foundation program along with Director General, NPTI and other officials

One-week training program on “Recent Trends in Power Sector” for the officials of MoP, held at NPTI Faridabad

understanding of Planning, Functioning & Operation of Generation, Transmission & Distribution System, Renewable Energy, Energy Transition, Carbon Neutrality etc. This course is being conducted through classroom mode with active learning manner along with industry-based examples of different technologies including case studies used in the power industry to have a 360-degree view of the entire power sector. It is one of a kind training program that not only covers the entire spectrum of power sector but also incorporates in its curriculum, activities like Yoga, sports, cultural etc. for a holistic personality development of individuals. Through Hands-on-Practice, professionals would be now confident to operate the plant, process & system in real time.

So far, NPTI has conducted 19 batches in which a total of 1933 fresh recruits from various CPSEs such NHPC, NTPC, REC, PFC, PowerGrid, Grid-India etc have completed their mandatory foundation program.

2.6 CAPACITY BUILDING PROGRAMS

Revamped Distribution Sector Scheme (RDSS)

NPTI has identified five training programs under the RDSS covering Smart Metering, AMI, SCADA, etc. One part of the training focuses on the following: up-gradation of human skills; process

6-Days Training and capacity building program on “SCADA, IT/OT Technologies and DMS & OMS Systems”, held at NPTI Faridabad

One Day National seminar on Cyber Security, Importance and Challenges organized by NPTI at IIT, Delhi

improvements; augmentation of Smart distribution infrastructure including Smart Meter & SCADA System, Training & capacity building for personnel involved in execution of the Scheme at field level, awards and recognitions etc.

Under this scheme, NPTI has conducted 229 programs in total through which 7542 employees from more than 55 DISCOMs across the country were trained.

Cyber Security

As per Article-8 of the CEA (Cyber Security in Power Sector) Guidelines, 2021, National Power Training Institute (NPTI) in consultation with CEA has identified and designed domain specific courses on Cyber Security for different target groups in Power Industry. NPTI is organizing classroom training programs along with Hands-On Training programs for personnel having authorized cyber or physical access (unescorted or escorted) to their critical systems.

NPTI provides following Cyber security training and certification programs :

1.) Basic level
2.) Intermediate level
3.) Advanced level

All personnel engaged in O&M of IT & OT systems shall mandatorily undergo courses on cyber security of Power Sector from NPTI.

Mr. Bibhu Bhuyan, Managing Director of Assam Power Generation Corporation Ltd. (APGCL) has inaugurated 9-Weeks Induction training program for the newly recruited Officers of APGCL

DG, NPTI welcoming Sh. Alok Kumar I.A.S (Retd.), former Power Secretary, Govt of India to the lecture session for Directors of CEA

NPTI has trained a total of 2370 partcipants under the basic and intermediate level cyber security programs.

Training Program for Rooftop Installations under Pradhan Mantri Suryoday Yojana

NPTI initiated two-day Pilot Training Programs on Rooftop Solar Installations at ITI Karaundi in Varanasi, A.V. Parekh Technical Institute in Rajkot and at GETRI, Vadodara. The program focused on imparting knowledge about the fundamentals of RTS components, inspection procedures, installation and commissioning techniques, as well as testing and maintenance protocols.The events received valuable support from UPNEDA, MGVCL, and PGVCL. More than 200 participants attended the training programs from various ITI/Diploma Institutions.

North Eastern Region Power System Improvement Project

Under the NERPSIP, there are various capacity building programs conducted by NPTI such as Operation & Maintenance of Switchgear and Relays, Testing, Commissioning and Operation & Maintenance of Transformers, Measures Relating to Safety and Electrical Supply as per CEA Regulation 2010 for Engineers, Condition based Monitoring of Sub-station. These comprehensive 1-week capacity building programs have been proposed to create technically trained manpower at junior and middle level professionals with the expertise to manage, operate, and maintain electrical systems.

During FY 2023-24, NPTI has conducted more than 40 such training programs trained around 800 trainees.

2.7 CUSTOMIZED TRAINING PROGRAMS

Training program for Financial Institutions on Energy Efficiency Financing

National Power Training Institute (NPTI) under the aegis of the Bureau of Energy Efficiency (BEE) organized “Training Program for Financial Institutions on Energy Efficiency Financing” in six different batches at different NPTI locations across India. The objective of the training program is to build greater knowledge and confidence within the financial sector on Energy Efficiency financing. Total 144 participants from various Banks, NBFC’s etc. participated in this workshop.

Training Program for Forum of Regulators

National Power Training Institute, Faridabad organizes two-day residential training program on “Protection of Consumer Interest” for the ombudsman and officials from the Consumer Grievance Redressal Forums (CGRF), Regulatory commissions of various states.

This program is conducted every year under the aegis of Forum Of Regulators. The objective of the program is to discuss various regulations, laws, consumer issues and case studies pertaining to the power sector. In the year 2023,

Unveiling Urja Yoddha module for linemen training for BSES Rajadhani Ltd., held at NPTI Badarpur

the program was conducted on 24th and 25th August.

Training Program for Distribution Linemen

NPTI has conducted **"Urja Sarathi", "Uttam Urja Sarathi", "Urja Sarathi 2.0"** Training Programs for the linemen of BSES Rajdhani Power Ltd., Delhi. Around 2500 Distribution Linemen were comprehensively trained and certified in the areas of basics of Electricity, Poles, Pole erection, mounting, stringing, clearances, sub-station equipment such as DTs, Circuit Breakers, earthing with their safe operating procedures and accent on Safety. The feedback from BSES is that this training has immensely benefited the Distribution Linemen with zero number of accident and casualty for the last one year.

NPTI also conducted Three days onsite training program for sub station operators, of UPPSKNL on 'O&M of Distribution substation' at DVVNL Agra.

In March, 2024 NPTI Badarpur has started "**Urja Yoddha**" training Programs for the linemen of BSES Rajdhani Power Ltd. Approximately 4000 linemen are to be trained during the next year.

Power System Operation Training and Certification

NPTI has been conducting Certification of Power System Operators since 2011. Training courses conducted at our institutes at Badarpur, Durgapur, Faridabad, Bengaluru, Guwahati and Alappuzha are designed with necessary inputs which enables the trainees to take up the various System Operation Certification Examinations.

A) Basic level on-line System Operator Certification

A total of 2976 appeared for the Basic Level Certification Examinations Specialist level courses on "Regulatory Framework in Power Sector", "Power System Reliability", "Renewable Energy Sources and Grid Integration", "Power

Inaugural session of Induction Training for ETs/TOs batch of NHPC

National Conference on Biomass **"3P-Pellet to Power to Prosperity"** to promote use of Biomass Pellets in thermal power generation.

System Logistics" and "Power Market Specialist" are being conducted at Corporate Office, Faridabad and PSTI, Bengaluru.

B) Specialist Level Online System Operator Certification

In the "**Regulatory Framework in Power Sector**" 429 System Operators appeared for the certification examination. In "**Power System Reliability**" and "**Power System Logistics**" 272 and 44 System Operators, respectively have appeared for the examination.

2.8 SIMULATOR TRAINING

Simulators at various NPTI locations are housed in existing Simulator Training Centres along with classrooms and other infrastructural amenities to provide full-fledged training programs. The simulator design includes equipment, instrumentation and controls that enable the operator to function in all modules with optimal specified operation conditions including normal, abnormal or emergency operating conditions. The protections, interlocks, logics and controls of the real plant are incorporated in the simulation system.

Multi-Function Smart Grid Simulator at NPTI Faridabad

2.9 OTHER TRAINING PROGRAMS

Mission SAMARTH

In order to address the issue of air pollution due to farm stubble burning and to reduce carbon footprints from thermal power generation, the Ministry of Power has decided to set up a National Mission on use of Biomass in coal based thermal power plants. This would further support the energy transition in the country and our targets to move towards cleaner energy sources.

The Mission is taking steps for development of the biomass supply chain, sensitizing stakeholders and encouraging budding entrepreneurs.

NPTI has conducted 29 training programs for Farmers, Pellet manufacturers and Thermal Power Plant Officials from October-2021 to October-2022 and trained 3,180 personnel under National Mission on use of Biomass in Thermal Power Plants (SAMARTH).

Skill Development Training

NPTI conducts various Skill Development Programs. Recently, NPTI, Neyveli has conducted one-week Skill Development Program

Trainees at 800 MW Simulator at NPTI Faridabad

Inauguration of NLCIL CSR Sponsored PGDC and PDC in PPE by Shri Prasanna Kumar Motupally CMD, NLCIL in the presence of DG, NPTI held at NPTI, Neyveli

for Instructors of the Department of Employment and Training, Govt.of Tamilnadu. Instructors from various Government ITIs have participated in this program. NPTI, Durgapur has also conducted two batches of Skill Development Programs each of 3 months duration, sponsored by NTPC-SAIL under their CSR.

WePower

On the occasion of International Women's Day 2024, NPTI celebrated a significant milestone with the conclusion of the SAR100 Program Capstone Week and Award Ceremony at AIT Bangkok as Dr. Tripta Thakur, Director General, NPTI was bestowed the graduation certificate by Dr. Sudha Murty, Indian Educator, Author, Philanthropist and former chairperson of the Infosys Foundation in the presence of Prof. Kazuo Yamamoto, President of AIT and Prof. Faiz Shah, Program Lead, WePOWER-SAR100.

Dr. Tripta Thakur, Director General, NPTI headed the Regional Working Group (RWG) from India and made significant contributions to the successful conduction of the SAR100 training series started in July, 2023 and also delivered ectures in different modules for the 100 women participants of seven South Asian countries.

The SAR100 program offered a comprehensive 8-month curriculum culminating in a capstone seminar. The Capstone Week marked the achievements of the SAR100 participants, showcasing their potential as future energy sector leaders. The distinguished guests from The World Bank, UN ESCAP, and various embassies highlighted the event, underscoring the importance of global cooperation for gender equality and sustainable progress. The 5-day event, from 4th - 8th March, 2024 concluded with the celebration of the accomplishments of women engineers marking a pivotal step toward empowering women in the power and energy sectors.

Women empowerment

Being the apex body of training in the power sector and aligning with the Government of India's commitment to the cause of empowering women, NPTI conducts various programs fostering the advancement of girl students and trainees. Recently, Power System Training Institute, Bangalore has conducted one week internship program on "Accounting and Personality Development" for the Women Students of Vivekananda College of Arts and Science for Women, Elayampalayam, Namakkal District,

Participants of WePOWER-SAR100 with Dr. Sudha Murty during their graduation ceremony at AIT, Bangkok

DG, NPTI along with other delegates at the India International Science Festival

NPTI, Nagpur conducted Two-Weeks Training Program on
"Management of Overhead Transmission Line Parameters" for the participants from Burundi Republic."

Tamil Nadu. Director General, NPTI, Dr. Tripta Thakur was instrumental in conducting the "Women Scientists and Entreprenuers Conclave" at the 9th edition of India International Science Festival,2023, organized by the Department of Science and Technology, Govt. of India.

NPTI (Eastern Region) successfully conducted Capacity Building on Energy Conservation and Energy walk through Survey for girls students in Uttar Pradesh & Schools (KGBVs) under UPNEDA. Under this project, in Phase -1 & Phase-2 , more than 51000 (Fifty one thousands only) Girls Students & more than 2400 School Teachers were trained.

2.10 INTERNATIONAL TRAINING PROGRAMS

Professionals from various countries like Afghanistan, Bangladesh, Belarus, Bhutan, Cambodia, Ecuador, Ethiopia, Iraq, Kenya, Libya, Malaysia, Mexico, Myanmar, Nepal, Nigeria, Oman, Philippines, South America, Sri Lanka, Sudan, Syria, UAE, Zambia, Zimbabwe etc. have also undergone training at NPTI's various training Institutes.

In the year 2023, the international trainings conducted by different centres of NPTI Includes Distribution planning with GIS based asset management for engineers of Nepal Electricity Authority.

e-ITEC Program, Ministry of External Affairs, Govt. of India : NPTI conducts training programs through ITEC, MEA, Govt. of India for the countries throughout the world i.e. SAARC, African Countries etc. This training program is also conducted on online platform.

Inaugural Function of 01 Week Training Program on "Bearing Maintenance & Lubrication" for the Executives from M/s Druk Green Power Corporation Ltd, Bhutan Conducted from 11.09.2023 to 15.09.2023 at NPTI, Alappuzha,Kerala

3. UPCOMING INITIATIVES

3.1 LEARNING MANAGEMENT SYSTEM (LMS)

LMS allows trainees to access study material from anywhere and at any time as centralised information aggregated in one location, as well as online and blended learning solutions that promote and enhance traditional educational methods.

LMS can also save organization's time and money as it allows easy administration of information in a user friendly, web-based environment. It can also automate administration and tracking and reporting of training events. Initially NPTI is planning to launch courses on Basic Course on Cyber Security, Specialized Course on Cyber Security, SCADA & Substation Automation, and Regulatory Issues in Power Sector on the LMS which later on will have more courses on newer technologies in the Power Sector.

3.2 NATIONAL SCADA RESOURCE CENTRE (NSRC)

The Ministry of Power (MoP) launched, Distribution Sector Scheme (RDSS) in July 2021. Apart from its twin objectives related to distribution infrastructure and institutional capacity building for DISCOMS, the scheme also envisages the establishment of SCADA/DMS in 100 towns and basic SCADA in 3,875 towns. Accordingly, a state-of-the-art National SCADA Resource Centre (N.S.R.C) is being established at NPTI in association with Power Finance Corporation Limited (PFC) to provide hands-on training on vendor-neutral platforms on upcoming distribution SCADA in various DISCOMS across India. NSRC will do the handholding of DISCOMS for the adoption of new technologies and it will also serve as a platform for knowledge exchange and peer-to-peer learning.

3.3 PGDC IN POWER DISTRIBUTION AND EMERGING TECHNOLOGIES

NPTI in association with BSES Rajadhani is developing a customised comprehensive training curriculum as per BSES business requirements and train the workforce in classroom and on-the-job training as internship for a period of one year.

3.4 MANAGEMENT DEVELOPMENT PROGRAMS

In today's digital age where every sector is shifting towards automations, data is of utmost importance and keeping this in view, NPTI is bringing the below-given application oriented Management Development Programs to its training curriculum. These hands-on programs include course materials with Practice Playbooks, Tutorial handouts, shared drive knowledge repository and Exercise files.

1. Business Intelligence, Data Visualization and Dashboarding and Data Mining.
2. Data science and Analytics.
3. Robotic Process Automation and Cloud Services for Power Utilities.

Inaugural of Learning Management System at NPTI by Sh. Krishan Pal, Hon'ble Minister of State of Power and Heavy Industries

4. INFRASTRUCTURAL FACILITIES

4.1 HOT LINE TRAINING CENTRE

A facility has been created at NPTI's Hot Line Training Centre (HLTC), Bengaluru for Live Line Maintenance of Transmission Lines upto 400 kV (first of its kind in Asia) which enables the trained personnel to attend the maintenance requirements without power interruptions. Facility for water washing of sub-station equipment is also available.

Hot line maintenance activities in EHV electrical sub-station and transmission line

4.2 MODELS

All the Institutes have a good number of static and dynamic models relating to various main systems. Equipment of Thermal Power Stations, Hydro Power Stations and Power Systems and models for demonstration in diverse areas of trainings conducted at NPTI, are also available.

4.3 LABORATORIES/WORKSHOP

The institutes have well equipped laboratories and workshops with wide ranging facilities for imparting training to all cadres including Technicians, Operators and Engineers, in various aspects of Power Generation, Transmission

Lab visit by DVC trainees at HPTC, Nangal

Distribution and Operation. Some of the areas where expertise has been built:

- Electrical laboratories with facilities for testing of relays, Control and Instrumentation Laboratories with facilities for testing, calibration and repairs of different types of process control instruments.
- Maintenance workshops for Valves, Bearings & Shaft alignment, Pumps, Motors etc.
- Power System Studies Laboratories are equipped with Transmission and Distribution System Software where studies such as load flow analysis, short circuit studies, transient stability studies, relay coordination studies, optimal capacitor placement, network reduction and optimal separation point can be conducted.

4.4 CLASSROOMS

All the institutes have modern classrooms equipped with latest teaching aids and audio-visual aids, required for efficient running of training programs. Video conferencing facility is available in all the institutes.

Technical Models and Technical Kits for demonstration

Library

4.5 LIBRARY

NPTI Corporate Centre library has a large collection of books and video packages on power generation, transmission and distribution technologies, various branches of engineering, science, industrial relations, management etc. It subscribes to a number of Indian and foreign technical journals and periodicals.

All regional institutes have modern libraries stocking a large collection of books and multimedia films on Power Station Technology, Mechanical Engineering, Electrical Engineering, Power Plant, Chemistry, Control and Instrumentation, Electronics, Computers, Management etc.

4.6 AUDITORIUM, CONFERENCE HALL, RESIDENTIAL QUARTERS

All Institutes of NPTI are situated in picturesque landscapes. They have auditorium/conference hall and classrooms with most modern amenities for conducting the training programs, conferences, seminars and workshops. All the campuses have residential quarters for the employees, guesthouse, hostels, sports facilities, gymnasium and canteen. The campuses and hostels are Wi-Fi enabled and provide a hygienic and homely atmosphere to the trainees.

4.7 HOSTEL FACILITIES

Residential Services are available for Regular Trainees, Executives and Foreign Nationals in all the Institutes. Well-furnished hostels for Executives and Trainees with modern lodging and boarding facilities are available in all Institutes. NPTI Corporate Office, Faridabad can accommodate about 550 trainees. An international hostel with 25 double bedded rooms is available at Faridabad.

Well-furnished hostels are also available at each of the regional institute of NPTI where modern and hygienic lodging and boarding facilities are available.

4.8 SPORTS FACILITIES AND MEDICAL SERVICES

A well-equipped gym, playground and courts of badminton, volleyball, basketball etc. are also located within the NPTI campus. Services of well qualified doctors are available on part-time basis in each of the Institute Complex.

Auditorium

Conference Hall

Hostels at NPTI, Faridabad



Sports and Gym facilities

4.9 FACULTY MEMBERS

NPTI's faculty consists of highly qualified, award winning, scholarly and experienced men and women who are leaders in their respective fields. Our faculty members come from across the country, sharing their perspective, wealth of knowledge, experience, qualification and expertise with students and working Professionals. Faculty members at NPTI have successfully developed numerous industry responsive courses to ensure trainees bring out the best in them and excel in their careers. Details of the faculty members are available on NPTI's website ***www.npti.gov.in***.

4.10 HOW TO APPLY

NPTI regularly organizes Training programs/ Seminars/Workshops in collaboration with National/ International Power Sector Organizations, details of which are prominently displayed on the website.

Nomination along with course fee for various courses may be sent to The Principal Director/ Director of the respective institute at least 15 days in advance from the date of commencement of the course. Aspiring students for PGDC courses may visit the website, and keep abreast with announcements of the various programs and may apply as per the instructions therein. The information and brochures of different workshops, seminars and conferences being conducted at NPTI are also available on the website. Application/Registration to the workshops/ seminars/conferences may be done as mentioned in the respective brochures.

Note : The minimum number of participants required for conducting any training program is 10. Else, the program will be postponed.

5. CONSULTANCY SERVICES

In order to serve the industry requirements and make best usage of infrastructure and expertise, NPTI has been providing consultancy services to various Power Sector Organisations involved in Generation, Transmission and distribution. NPTI also provides Consultancy in the field of Human Resources Development including Training Need Analysis, Up gradation of training facilities, Customized Course Designs, Capacity Assessment/Evaluation for Promotion etc.

Two days capacity building program on Implementation of provisions of 'Energy Conservation Act', organised at Chandigarh by NPTI, Faridabad

National Power Training Institute (NPTI) and PTC India have entered into a Memorandum of Understanding to establish a Centre of Excellence (CoE) for Research & Development in the Energy Domain, with a focus on promoting sustainable development goals.

6. CLIENTELE AND RECRUITERS OF NPTI

INTERNATIONAL CLIENTELE

Afghanistan, Bangladesh, Belarus, Bhutan, Cambodia, Ecuador, Ethiopia, Iraq, Kenya, Libya, Malaysia, Mexico, Myanmar, Nepal, Nigeria, Oman, Papua New Guinea, Philippines, South America, Sri Lanka, Sudan, Syria, UAE, Zambia, Zimbabwe

NATIONAL CLIENTELE

NPTI has been catering to the Training Needs of Power Sector Organizations and Process Industries such as Steel, Cement, Aluminum, Fertilizers, Refineries viz., ACC, AECO,APGENCO, Avantha Power & Infrastructure Ltd., BBMB, BHEL, Bokaro Power Supply Corporation Ltd., BPCL, C.V. Raman Engineering College, Bhubaneswar (Odisha), CEA,CESC, Chhattisgarh State Power Generation Corporation Ltd., Chhattisgarh State Power Transmission Ltd., CLP (I) Pvt. Ltd., CSPTCL, CVPPL, Dakshin Haryana Bijli VitranNigamLtd., DPL, DTL, DVC, ECIL, FACT, Forum of Regulators, GAIL, GMR Energy Ltd., GRASIMI ndustries, HINDALCO, Hindustan Copper Limited, HPGCL, Ideal Energy Power Ltd., IFFCO, IIIT Bhubaneswar, IIT Indore, IOCL, IRCON, IREDA, Jindal Power, KPCL, KRIBHCO,KSEB, L&T Power Ltd., Lanco Infratech Ltd., Lanco Kondapalli Power Ltd., Lanco Power, Lanco Vidarbha Thermal Power Power Ltd., MOIL Nagpur, MPEB, MPPTCL,MSETCL, NALCO, National Hydroelectric Power Corporation Ltd., NEEPCO, NFL, NHDC,NIST Bhubaneswar (Odisha), NIT Hammirpur, NIT Riapur, NIT Warangal (Telangana),NITS Gwalior, NLC, NPC, NTPC Baruani, NTPC, OHPC, ONGC, OPGCL, POSOCO, PowerGrid Corporation of India Ltd., PPN Power, Generating Company Ltd., Rajasthan Rajya Vidyut Utpadan Nigam Ltd., Reliance Infrastructure, RRUVNL, S R Group of Institutions Jhansi, SAIL, SJVNL, South Eastern Coalfields Limited, Sterlite Grid Ltd., Sterlite Power Transmission THDC, Tata Power Company Ltd., THDC LTD., Torrent Power Ltd., Toshiba, Udupi Power Corporation Ltd., UP Rajya Vidyut Utpadan Nigam Ltd., UPRVUNL, WAPCOS, etc.

RECRUITERS

Our students of Post Graduate Diploma Courses (PGDC) and Post Diploma Courses (PDC) have been recruited by reputed companies like ABB, ABPS Advisory, Adani Power, APPCPL, Atkins Global, Azure Power, Bajaj Electricals, Mumbai, Bajaj Energy (LPGCL), Bhadreshwar Vidyut Private Limited (BVPL),BSES, CFL, CLP,CMR Ltd. Warora, Crisil, Datagen, Deloitte, Easun Reyrolle, Eco Securities, Enercon Capital, Energy Exempler, Erudite, Enzen Essar Power, Essar Power, ETAC, Feedback Ventures, Gammon India, Genus Power & Infrastructure, Global, GMR, HINDALCO, HPPL, I2S Technologies, IL&FS, Infraline, JK Cement, JP Power, JVS Electronics, Kalkitech, Kalpataru Power Transmission, Kamini Engg. Corp. (KEC), KPMG, KSK Energy Ventures, L&T (NABHA Power LTD.), Lahmeyer, Lanco, LNJ Bhilwara, Manikaran Power, Moser Baer, NCC, NDPL, Noida Power, Oblum Electric, Open System International, Philips Carbon Black Ltd., Power Mech. Ltd., PRDC, PTC,PWC, Reliance Power, ReNew Power, Samsung, Satyam, Schweitzer Engineering Lab, Secure Meters, Shirpur Paper Mill, Shree Cements Ltd., SKSPGCL, Sterlite Power, Suzlon, Tata Power, TATA Steel, Teems India Towerlines, TERI, Thermax Co., Torrent Power, Toshiba T&D, Vedanta, Korba, Vedanta, Vijay Electricals, Virtues Energy, VISA Steel Ltd. Orissa, etc.

Dr. Tripta Thakur, Director General, NPTI and Major General Rajesh Kumar Jha, AVSM (Retd.), Director (Personnel), NEEPCO India, signed an MOU for imparting training jointly for working professionals from NEEPCO

NPTI signed an agreement with Madhya Pradesh Skill Development Project (Govt.of.Madhya Pradesh) and Global Skills Park for Setting up a Centre of Excellence for upskilling the Students, Trainees, DISCOMs Employees and Power Sector professionals on 04th Dec 2023

An MoU was signed between NLC India Ltd and NPTI, Neyveli at NLCIL Corporate Office, Neyveli.

7. TRAINING PROGRAMS

7.1 SIMULATOR TRAINING PROGRAMS

Program Profile/ Content

I DAS Based Simulator System and Conventional & Video Process Control System

II DCS Based Simulator System

7.2 INDUSTRY INTERFACED LONG TERM TRAINING COURSES (17 WEEKS TO 52 WEEKS)

Program Profile/ Content

7.3 MEDIUM TERM TRAINING COURSES (5-16 WEEKS)

Program Profile/ Content

7.4 SHORT TERM TRAINING COURSES (1 DAY TO 4 WEEKS)

Program Profile/ Content

7.1 SIMULATOR TRAINING PROGRAMS

Objective

The main Objective of Simulator System to emulates the behaviour of the entire process simulation in a Real-Time Scenario for a meaning full off-job Operation Reflex Training to reduce plant and system tripping as well as optimum utilization of Auxiliary resources in Power stations.

Who may Attend

Engineering/Diploma Graduates Students/ Power Plant Working Professionals (Junior and Middle Level Managers/Executives/officers) may attend the Simulator Training Programs. The Institutes of NPTI are well equipped with Hi-Tech infrastructural facilities for conducting different courses on technical topis covering the needs of Thermal, Hydro, CCGT, Transmission & Distribution Systems. The training on these simulators will benefit operators, engineers and shift incharge Engineers.

Program Profile/ Content

I DAS Based Simulator System and Conventional & Video Process Control System

7.1.1 210 MW Fossil Fuel Power Plant Simulator Training

Program Profile

- Cold start, up to 100% load.
- Partial load to full load and back to partial load.
- Manoeuvering of different auxiliaries.
- Hot start/warm start to full load.
- Planned shut down.
- Over-rides and alarms during different exercises.
- Malfunctions.

7.1.2 500 MW Fossil Fuel Power Plant Simulator Training

To train engineers on full scope replica simulator of 500 MW thermal power station, in all aspects of operation and helping them to make better judgement calls/responses to malfunctions and emergent situations by imparting them hands on practice in:

a) Full Scope/Conventional Panel Operation Mode.

b) CRT – Keyboard Based Operation Mode.

Program Profile

- Cold start and up to 100% load.
- Partial to full load and back.
- Hot start / Warm start to full load.
- Planned Shutdown.
- Maneuvering of different auxiliaries.
- Operation under emergency conditions.

II DCS Based Simulator System

7.1.3 430 MW Combined Cycle Gas Turbine Power Plant Simulator Training

Program Profile

- Cold start and up to 100% load.
- Partial to full load and back.
- Hot start / Warm start to full load.
- Planned Shutdown.
- Manoeuvring of different auxiliaries.
- Standalone Operation of Gas Turbine.
- Operation under emergency conditions.
- Operation of Gas turbine in Open Cycle Mode.

7.1.4 250 MW Hydro Simulator Training

Program Profile

- Start-up of Machine & load upto 100%.
- Partial load to full load and back to partial load.
- Maneuvering of different auxiliaries.
- Planned shutdown.
- Operation under emergency.
- Over-rides and alarms during different exercises.
- Malfunctions.

7.1.5 Dispatcher Training Simulator (DTS)

Program Profile

- Dispatcher Training Simulator Overview.
- Active and Reactive Power Control.
- Indian National Network including HVDC Lines.
- Prime mover dynamics. (Hydro, Steam, Gas and Pumped storage units)
- Load shedding schemes.
- Islanding schemes.
- SCADA Operation.
- Automatic Generation Control.
- Islanding and Integrated Operation.
- System Occurrence and Restoration.

- System Stability.
- Voltage Control and Voltage Collapse Simulation.
- Prevention of Grid Disturbance.

7.1.6 800 MW/660 MW (Emulated) Super Critical Thermal Power Plant Training Simulator

Program Profile

- Cold start up to 100% load Hot start/warm start up to full load.
- Planned shut down.
- Auto/manual control of parameters.
- Operation under emergency conditions.

7.1.7 Multifunctional Simulators

i 210 MW-Thermal Power Plant

ii 250 MW-Hydro Power Plant

iii 500 MW-Thermal Power Plant

iii 550 MW-Combined Cycle Power Plant

iv 800 MW-Supercritical Thermal Power Plant

v SCADA & Smart Grid Simulator

vi Flexibilization of Thermal Power Plant Operating Procedure and Training Curriculum at 55% Minimum Technical Load of Thermal Generating Units (210 MW & 500 MW)

The training on the multifunctional configured simulators may be on only the Thermal Power Plants (210/ 500/ 800 MW) or an integration of Thermal (210/ 500/ 800 MW), Hydro (250 MW), SCADA and Smart Grid or even a integration of Thermal (210/ 500/ 800 MW), CCPP (430/ 550 MW), Hydro (250 MW), SCADA and Smart Grid Hands on training on either of the combinations would give a perfect understanding of integrated operation of the power plant & power system.

As per guidelines of CEA, NPTI conducts training module on "Flexibilization of Thermal Power Plant Operating Procedure and Training Curriculum at 55% Minimum Technical Load of Thermal Generating Units (210 MW & 500 MW)".

Program Profile

- Start up to Synchronization and Synchronization to Full load and Back.
- Planned shut down.
- Maneuvering of different auxiliaries.
- Operation under emergency conditions.

Two-weeks "CCGT & CCPP Simulator Training" for executive engineers of Petroleum Development Oman held at NPTI, Faridabad from 12.02.2024 to 23.02.2024.

7.2 INDUSTRY INTERFACED LONG TERM TRAINING COURSES (17 WEEKS TO 52 WEEKS)

Objective

To prepare the fresh Graduate Engineers to become Power Station Managers in Operation and Maintenance of Thermal Power Stations, hydro Power Plant, RE Plants, Transmission and Distribution System. Focus of these course is to equip the students with technologies, economics and policy involving energy systems and supply with conventional and Renewable Energy sources. Detailed expertise will be offered in thermal power plant systems, hydropower plant systems, Solar Energy Systems involving photovoltaic as well as thermal Energy Systems, Wind Energy, Biomass, Geothermal, Tidal and Wave Energy, Hydrogen & Fuel Cells, Small Hydro along with problems associated with grid integration issues of various sources, problems and interfacing technologies and concept of Smart Grid, Smart Transmission and Smart Distribution. The candidates shall develop their skills to design, O&M of plants systems to get jobs in these areas.

Who may Attend

Engineering/Diploma Graduates Students/ Working Professionals (Junior and Middle Level Managers/Executives/officers) may attend the long term programs (PGDC, PDC, GET etc.).

The admission to the following one year Post Graduate Diploma Courses (PGDC) is done through a Common Entrance Test (CET) held on all India Basis:

- Power Plant Engineering
- Renewable Energy and Grid Interface Technologies
- Smart Grid Technologies
- Energy Market Management
- Power System Operation

Admission notification is published in the national newspapers and NPTI's website, www.npti.gov.in. Aspiring students are encouraged to visit the website for all information about the courses. The prospectus covers all details like the CET date, the eligibility criteria, the counseling date and the date of commencement of the courses. Aspiring students can visit NPTI's website for the prospectus.

Program Profile/ Content

7.2.1 Post Graduate Diploma Course (PGDC) in Power Plant Engineering

Program Profile

Module No.	Description	Duration (weeks)
1	Power Plant Familiarization & Industrial Safety.	5
2	CCGT, Co-Generation & Hybrid Systems.	2
3	Power Plant Briefing & Scheme Tracing work.	3
4	Power Plant Operation.	2
5	Power Plant Performance & Efficiency Calculation.	1
6	Nuclear Power Plants.	1
7	Advanced Steam Generation Technology - Supercritical & FBC.	1
OJ-1	Rotational On-Job (Operation).	3
9	Chemistry, Metallurgy, NDT & Welding.	1
10	Renewable Energy (RE) resources, Conventional & RE Systems.	1
11	Solar PV & Thermal Technologies.	3
12	Business Communication & Personality Development.	1
First Semester Examination		1
13	Power Sector Reforms and Regulations.	1
14	Wind Energy and Hydro.	2
15	Bio Mass, Bio Energy and Waste to Energy.	2
16	Energy Storage Technologies.	1
17	Power Plant Protection.	2
18	Maintenance Planning Inspection & Cost Control.	2
19	Control & Instrumentation.	2
20	IT Application in Power Sector & GIS.	1
21	Load Dispatch.	1
22	Renewable Energy Grid Interface Technologies.	1
23	Erection, Commissioning & Construction Management.	2
24	Energy Audit & Project Management.	1
25	Environment Management.	1
OJ-2	Rotational On-Job. (Maintenance)	4
26	Simulator Training, Visit to Manufacturers Works.	3
Second Semester Exam		1

7.2.2 Post Graduate Diploma Course (PGDC) in Renewable Energy and Grid Interface Technologies

Program Profile

Module No.	Description	Duration (Weeks)
1	Evolution of Indian Power Sector, Legislative & Regulatory Framework	04
2	Power Plant Introduction & Industrial Safety	01
3	Power Plant Familiarization and Plant Briefing & Design	03
4	Renewable Energy Sources Conversion and Technology	04
5	Solar Photovoltaic Power Plant: Planning, Design and Balance of Systems	03
6	Overview of wind energy, Biomass energy & Microgrid, Hybrid energy system and Integration, Overview of Hydro Power Plant	04
7	Renewable Energy Grid Integration & Concept of Smart Grid	02
8	Business Communication & Personality Development (Based on Viva Voce)	01
9	Wind Energy Technologies and Rotational On-Job Training – 1	03
10	**First Semester Examination**	**01**
11	Solar Thermal Applications-1: Low and Medium Temperatures	01
12	Solar Thermal Applications-2: Concentrators and Solar Thermal Power Plants	01
13	Tide, Wave Energy, Fuel Cell, Waste To Energy, Hydel Energy, E-Mobility, Green Hydrogen Energy, Energy Storage, Cyber Security	05
14	Simulator - SCADA & SMART Grid and Renewable Energy	02
15	Small, Micro & Mini Hydro Power Plant	02
16	Micro Grid Lab Experiments	02
17	Bio-Mass Technologies (Bio Mass Energy & conversion, Concept of Co-Generation & waste Energy Recovery) and Rotational On-Job Training – 2	02
18	Solar Energy Technologies and Rotational On-Job Training – 3	02
19	Project Industrial Internship	08
20	**Second Semester Examination & Final Assessment**	**01**

7.2.3 Post Diploma Course (PDC) in Hydro Power Plant Engineering

Program Profile

Module No.	Description	Duration (Weeks)
1	General Introduction & Orientation	0.5
2	Concept of Hydro Power Stations, Site Section, Component and Layout	1.5
3	Hydro Mechanical Equipments	1
4	Hydro Turbines	1
5	Hydro Generator & Excitation	1
6	Transformers	1
7	Switchyard & GIS	1
8	Working Principles, Characteristics & Operation of Auxiliary System	1
9	Hydro Lab. Practical	1
10	Control & Instrumentation	1
11	C & I Lab. Practical	1
12	Electrical Lab. Practical	1
13	Protection & Interlocks	1
14	Power Plant Operation	1
15	Erection, Testing and Commissioning	1
16	Load Dispatch & SCADA	1
17	Power Plant Safety & Acts	1
18	On Job Training	2
19	Mechanical Maintenance	1
20	On Job Training in Mechanical Maintenance	1
21	Electrical Maintenance	1
22	On Job Training in Electrical Maintenance	1
23	Hydro Power Plant Simulator	1
24	Final Evaluation & Project Assessment	2

7.2.4 Post Graduate Diploma Course (PGDC) in Transmission & Distribution System

Program Profile

Module No.	Description	Duration (Weeks)
1	General Introduction Power Scenario & General Introduction.	1
2	Power Generation Thermal Power Plant Familiarization.	1
3	Power Transmission Lines Engineering and O&M.	2
4	Live Line Maintenance Technique.	1
5	Substation Planning & engineering	1
6	Substation Operation & Maintenance.	1
7	Load Despatch & Grid Management.	2
8	Communications in Power Systems.	1
9	Power Distribution/Distribution Lines/ Cables.	1
10	Systems Engineering O&M.	2
11	Distribution Sub-Stations.	1
12	Distribution Metering.	1
13	Energy Audit and Conservation in	1

	Distribution Systems.	
14	Information Technology applications in T&D.	1
15	Power System Planning Studies.	1
16	Safety, Statutory Safety & Statutory regulations.	1
17	Commercial aspects Commercial aspects in T&D Systems.	1
18	Management of Electrical Contract.	1
19	New Technologies Power System Protection.	1
20	High Voltage Testing Power System Equipment.	1
21	HVDC Transmission System.	1
22	Simulator Training/Lab Simulator Training, Relay Testing.	1
23	Appraisal.	1

7.2.5 Post Diploma Course (PDC) in Power Plant Engineering

Program Profile

Module No.	Description	Duration (Weeks)
1	General Introduction and Orientation.	1
2	Environment & Personal Safety.	8
3	Power Plant Description.	6
4	Power Plant Scheme Description and Tracing.	2
5	Power Plant Operation (Supervisory).	2
6	Power Plant Chemistry.	1
7	Power Plant Instrumentation.	1
8	Power Plant Efficiency Performance.	1
9	Basic Welding Practice & NDT.	1
10	Maintenance Planning Inspection and Cost Control.	6
11	Power Plant O&M (On-Job) .	10
12	Introduction to Management.	1
13	Computer Application.	1
14	Power System Operation and Electrical Protection.	1
15	Power Distribution Engineering and Systems.	3
16	Distribution Metering and Techniques of Loss Minimisation.	3
17	Simulator.	2
18	Protection.	1
19	Final Appraisal.	1

7.2.6 Post Diploma Course (PDC) in Hydro Power Plant Engineering

Program Profile

Module No.	Description	Duration (Weeks)
1	General Introduction & Orientation	0.5
2	Concept of Hydro Power Stations, Site Section, Component and Layout	1.5
3	Hydro Mechanical Equipments	1
4	Hydro Turbines	1
5	Hydro Generator & Excitation	1
6	Transformers	1
7	Switchyard & GIS	1
8	Working Principles, Characteristics & Operation of Auxiliary System	1
9	Hydro Lab. Practical	1
10	Control & Instrumentation	1
11	C & I Lab. Practical	1
12	Electrical Lab. Practical	1
13	Protection & Interlocks	1
14	Power Plant Operation	1
15	Erection, Testing and Commissioning	1
16	Load Dispatch & SCADA	1
17	Power Plant Safety & Acts	1
18	On Job Training	2
19	Mechanical Maintenance	1
20	On Job Training in Mechanical Maintenance	1
21	Electrical Maintenance	1
22	On Job Training in Electrical Maintenance	1
23	Hydro Power Plant Simulator	1
24	Final Evaluation & Project Assessment	2

7.2.7 Graduate Engineers Course (Power Plant Engineering)

Program Profile

Module No.	Description	Duration (Weeks)
1	Introduction.	
2	Power Plant Description.	5
3	Power Plant Scheme Tracing & System Discussion.	2
4	Power Plant Operation.	3
OJ-1	Power Plant Operation (Manual).	4
OJ-2	Power Plant Operation (Supervisory).	4
5	Performance (Formal).	1
6	Safety.	1
7	Plant training. (Practicals)	5
8	Planning & Cost Control.	1
OJ-3	Maintenance. (Supervisory)	8
OJ-4	Performance. (On-job)	1
9	Chemistry.	1
10	Basic Welding.	0.5
11	Non-Destructive Testing.	0.5
12	Protection.	1
13	Introduction to Management.	2
14	Simulator Training.	2
15	Metallurgy.	1
16	Computer Applications.	1
17	Load Dispatch.	1
18	Control & Instrumentation.	2
19	Maintenance & Inspection.	4
20	Appraisal & Valedictory.	1

7.2.8 Graduate Engineers Course (Thermal Condensed)

Program Profile

Module No.	Description	Duration (Weeks)
1	Power Plant Introduction & Industrial Safety	0.5
2	Power Plant Familiarisation	4
3	Power Plant Briefing & Scheme Tracing	2
4	Power Plant Operation	1
5	Rotation On-job (Operation)	1
6	Power Plant Commissioning & Construction Management	1
7	Power Plant Performance & Efficiency Calculation	1
8	Power Plant Chemistry, Metallurgy NDT & Welding	1
9	Gas turbine & Combined Cycle Power Plant	0.5
10	Advanced Steam Generation Technology - Supercritical and FBC	0.5
11	Business Communication & Personality Development	0.5
12	Power Plant Protection	1
13	Energy Audit	0.5
14	Maintanence Planning & Cost Control	0.5
15	Maintanence Practice & Inspection	3
16	Load Despatch	1
17	Power Reforms and regulations	0.5
18	Control & Instrumentation	1.5
19	Environment Management	0.5
20	Rotational On Job (Maint.)	1
21	Simulator	2
	Project Presentation	0.5
	Examination	1

7.2.9 Post Diploma Course in Renewable Energy including Solar Technology

Program Profile

Module No.	Description	Duration (Weeks)
1	Energy Scenario & Development.	1
2	Major Energy Resources and Conventional Energy Systems	2
3	Legislative and Regulatory Framework in Indian context	1
4	Environmental concerns of Energy Generation	1
5	Socio economical aspects of Energy Resources	1
6	Solar Radiation, Solar Thermal Systems	1.5
7	Solar Thermal Systems and Application	1.5
8	Solar Photo-voltaic Systems	1
9	Solar Photo-voltaic Energy Conversion and Utilization	1
10	Biomass Energy	1
11	Wind and Hydro Energy	2
12	New Energy resources – Hydrogen Energy, Ocean Energy, Geothermal Energy, MHD, etc.	2
13	On Job Training / Visits to Solar Thermal/ Solar PV and other RE sites and Lab Work	2
14	Energy Storage Technologies	1
15	Integration of variable Renewable Energy with Grid	1
16	Appraisal & Financing of Renewable Energy Projects	2
17	Tariff and Commercial Aspects	1
18	On - Job Training / Visits to LDC/ SCADA facility	1
19	Project Presentation Appraisal & Feedback	2

Trainees from KPTCL, PSTCL, APTransco, GETCO, MSETCL and Madhav Engineers with the Hotline Model Tower during the 120th Live Line Maintenance Training Program at HLTC, Bengaluru

7.3 MEDIUM TERM TRAINING COURSES (5-16 WEEKS)

Objective

Medium Term Programs have been designed for the duration of 5-16 weeks as per the Power Sector need for the diploma, engineering graduates and working professionals to trained them as Skilled manpower for Power Station in Operation and Maintenance of Thermal Power Stations, hydro Power Plant, RE Plants, Transmission and Distribution System.

Focus of these course is to excel the candidates with technologies, economics and policy involving in the energy sector.

The candidates shall develop their skills to work as design engineer as well as O&M expert of plants systems.

Who May Attend

Engineering/Diploma/Graduates Students/ Working Professionals (Junior and Middle Level Managers/Executives/officers) may attend medium term programs.

About Admission

The admission will be done at institute level. Candidates may apply to the respective NPTI institute as mentioned in the table below. The details of admission notice, eligibility criteria, fee etc. will be announced by the respective institute on the NPTI website.

Program Profile/ Content

7.3.1 Three Months Course on "Design, Erection and Commissioning of Solar Power Plants"

Program Profile

- General: Global Energy Scenario, Indian Energy Scenario, Energy Policy.
- Solar Radiation: Physics of Solar radiation, Global Beam and diffuse radiation. Related Lab experiments.
- Fundamentals of Solar Cell: Solar PV basics, Solar PV Module, Solar Cell technologies, Crystalline cell, solar photovoltaic modules, Concentrators and PV Modules. Field Visits / Manufacturer's works.
- Balance of Solar PV Systems: Battery technology, Batteries for PV systems, DC –DC converters, Charge Controllers.
- Photovoltaic Power System: PV system configuration, Standalone system. Hybrid system and Grid connected systems.
- Planning & Design: Planning Procedure, System capacity and Energy Demand, Site selection, System concept, Module selection and PV Generator. Charge Controller and Inverter. Selection and inverter sizing, Generator Junction Box and Safety Measures.
- Pre-feasibility study, Feasibility study, Detailed project report, Design basis report, Project execution, Testing and Commissioning.
- Installation and Commissioning: Mounting System Cables, Earthing, Junction Box.
- Grid Integration & Control Techniques.
- Instrumentation & Measurements, Economical and Financial Analysis : SCADA system, sensors, data logger, Monitoring, data management, Analysis and performance. Financial Analysis, Life Cycle Costing, Environmental Analysis.

7.3.2 3 Months Course on "Distribution Substation Management & Optimal Utilization of Components"

Program Profile

- Introduction to Power Plants & Power Scenario.
- Fundamentals of Electricity, Power Quality & Harmonics.
- Planning & Engineering Design of Distribution Substation.
- Erection & Commissioning of Distribution Sub-Station equipment.
- HT & LT Switchgears, & Batteries.
- Cables & Metering: Types of metering, detection of theft/ tempering, unauthorized loads, investigation, legal aspects, anti-theft measures and case studies.
- Distribution Lines & PLC: Survey, Route alignment, GPS application, Line Components, Bill of Quantities.
- Protective Relays, Grounding & IE Safety Regulations: Relays – Types, construction, characteristics and location in substation, IR rules, safety Regulations.
- Distribution System Protection: Steady State Fault Analysis (SSFA). Voltage calculation at fault locations, Overvoltage protection, Principles of lightning protection.
- Distribution Automation, Distributed Generation & Integration
- Simulator Training at PSTI, Bengaluru, RT lab/ HV lab/ DTS lab.
- Rural Electrification & Smart Grids.

7.3.3 Live Line Maintenance Techniques (LLMT), Using Hot Stick Method (HSM)

Program Profile

- General Principles of LLMT.
- Introduction to maintenance of Power lines using Hot Stick Method.
- Practical oriented Operation covering various tower configurations.
- Safety aspects and Regulatory requirements.
- Study Tours to Certain Important substations and transmission line locations.
- Hands on training on commercial lines of various configurations up to 220 kV.
- Field testing of insulators - use of analogue and digital methods, demo on the use of Punctured Insulators - use of analogue and digital methods, demo on the use of Punctured Insulator Detector (PID) test kit.
- Introduction to maintenance using Bare Hand Method of Live Line Maintenance and switchyard maintenance using LLMT.

7.3.4 Live Line Maintenance Techniques (LLMT) using Bare Hand Method (BHM) on 400 kV Lines

Program Profile

- Brief revision on LLMT using HSM.
- Introduction to maintenance of Power Lines using Bare Hand Techniques.
- Additional Safety aspects and requirements.
- Practical Oriented Operation Covering various tower configurations.
- Hands-on training on 400 kV commercial lines of various configurations.
- Field training on testing of Insulators.
- Introduction to switchyard maintenance using LLMT.
- Study Tours to certain important substations and transmission line locations, if time permits. Major time will be devoted to impart training in the field on 400 kV transmission lines as well as on commercial lines of POWERGRID Corporation of India dealing with practical aspects.

7.3.5 Post Graduate Certificate Course in Power Plant Engineering

Program Profile

- General Introduction: Concept of Modern Thermal Power Plant, Location /Site Selection, Plant layout & Power Plant Safety.
- Constructional details and basic principles of large pulverized fuel Boiler and auxiliaries.
- Construction and working principles of Turbine and auxiliaries.
- Various types of Valves and Pumps.
- Construction and working principles of Alternators and Excitation Systems, Transformers, Motors, Switchgears, Power Supply System and Switchyard.
- Tariff Calculation.
- Tariff Based Bidding, Concept of UMPPs.
- Fuel Handling Plant, Ash Handling System and Cooling Water System.
- Water Sources and treatment.
- Operation, control and supervision of Boiler, Turbine and Alternator.
- Instrumentation & Control (including DAS & DDC) and Protection system
- Power Plant Maintenance practices.
- Scheme Tracing/ Plant Visits.
- Simulator Training.

7.3.6 Post Graduate Certificate Course (PGCC) in E-Mobility and Smart Utilities

Program Profile

- General Introduction: Evolution of Indian Power sector & Indian Electricity Act & Regulation.
- Various types of Power Generation (Hydro, Thermal, Nuclear & RE Sources).
- Basics of Power System, Traditional Grid and Micro Grid, Generation, Transmission & Distribution Challenges in India.
- Introduction to Smart Grids
- Advanced Meter Interface (AMI) - Overview, Smart Meters, DCUs, HES, MDM, Inter-operability, Standards, Protocols.
- ICT & Cyber Security and Smart Grid Security, IoT.
- Load Forecasting, Demand Side Management DER/DR/SCADA/EMS, WAMS.
- Power Electronics, Reactive Power Management & Outage Management, PMU, Project, Procurement, Contract & its Financial Management.
- GIS & Assets Management
- Understand Mobility and its evolutions, Electric Mobility and Environmental Impact Reduction, Economic Analysis, Electric Mobility and Infrastructures: Technical and Economic Dimensions.
- International Standards for EVs and their impact on EV deployment, EV System architecture and concepts, EV Drives and Controllers.
- Energy Storage Systems and New Batteries Technologies, Potentials and Forecasts, EV Charging Systems (V2G and G2V)

- Power grid and renewable energy resources interfacing for EV Development
- Smart Cities & its Pilot projects in India, Innovative Solutions For Smart Cities, Smart Transportation.
- Laboratory Session, Simulator, Plant Visit and On-Job Training.
- Project Works followed by end examinations.

7.3.7 Certificate Course for Hydro Power Plant Engineers and Supervisors

Program Profile

- Safety & First aid, General Introduction of Hydro Power Plant.
- Power Plant Familiarization of Hydro Power Plant Engineering.
- Construction details of Hydro Power Plant components : Generators, Turbine, Valves, Excitation System, Governing System etc.
- Switchgears, protection in HE station.
- Power Plant Operation and function of Load Dispatch Centre.
- Maintenance of Hydro Power Plant Equipment.
- Hydro Power Plant Simulator Training.
- Plant Operational Training at Hydro Power Plant (On-job).
- Plant maintenance Training at Hydro Power Plant (Onjob).
- Final assessment & Evaluation.

7.3.8 Specialized Training on O&M of Hydro Power Plant

Program Profile

- Concept of modern hydro power station, site selection, Components, layout.
- Hydraulic system, reservoir, storage capacity, dams and Barrages, intake, surge tank, power tunnels/ channel, fore Bay and penstocks, pressure shaft, surge shaft, tail race and tail race tunnel/channel, protection against water hammer and negative pressure in penstocks and suction head, Dewating of water conductor systems.
- O&M of Hydro Power Plant components; Generator, Turbine, Valve, Excitation system, Governing systems etc.
- Hydro Power Plant Simulator Training.
- Plant visits at Hydro Power Plant sites

7.3.9 Distribution Engineering

Program Profile

- Distribution Engineering: Growth, Developments, Equipment, Standards specification, construction. Practice and guidelines, design aspects-testing and installation of Distribution equipment-Lay out of Sub-Station.
- Safety, Protection, DSM and energy Audit/Metering: Safety Aspects, I.E. Rules and Regulation, Compliance, First Aid, Fire Safety.
- Energy Audit and DSM application in Distribution / Engineering: Energy Audit - need, Objective and Methodology, types, application & techniques, DSM - Methodology and Techniques, Loss reduction – Voltage control, VAR control, Reactive Power Compensation.
- Metering: Metering techniques, various types – LT meters and its application, Installation Testing and Commissioning of LT meters, defects and remedies - HT metering techniques.
- Billing, Power System Study, Distribution Planning Trends and Development: Billing system, Computer application in billing system, Distribution planning, Optimization of capacity and location of Distribution Transformers.

7.3.10 Control & Instrumentation for Supervisors/ Technicians

Program Profile

- Concept of instrumentation in Thermal Power Station.
- Instrumentation layout.
- Basic Science, Basic electricity and Basic Electronics.
- Pressure, Level, Low and Temperature measurement.
- Air supplies, pneumatic Instruments and drives.
- Telemetry.
- Introduction to Automatic Control System.
- DAS/DDC.
- Turbovisory instruments and Analytical Instruments.
- Practicals/Demonstrations.

7.3.11 Training Program for Supervisor/ Managerial Person Deployed in Power Industry

Program Profile

- Personality Development: Skills, Attitudinal Development, Leadership, Team Building, Value & Ethics.
- Business Communication skills, Negotiation.
- Man Power Planning (MPP).
- Quality of work Life (QWL).
- Career Planning & Quality Circles.
- Financial Management & Overview.
- Performance Appraisal.
- Man Power Audit.
- Human Resource Development.
- Case Studies.

7.3.12 New and Renewable Sources and Grid Integration in India

Program Profile

- Energy Sector Reforms, Regulations Environment and RE.
- Wind Energy Systems.
- Solar thermal power systems.
- Direct energy Conversation – Solar Photovoltaic, Fuel Cells.
- Waste to Energy.
- Solar passive Architecture.
- Biomass Energy Systems.
- Bio-Fuels
- RE and Grids Integration
- Economic Viabilty
- Case studies

7.3.13 Executive Development Program for the Supervisory Staff Working in Finance & Accounts Department

Program Profile

- Status & Responsibilities of Financial Executives: Development of Managerial Skills.
- Personality Development, Business Communication Skills, Negotiation Skills, Leadership, Team Building, Values & Ethics etc.
- Financial Management & Planning.
- Computer Awareness for finance personnel.
- Capital Budgeting, Costing & decisions.
- Operating & Financial Leverage Analysis.
- Dividend issues, policy & Decisions.
- Budgeting & Accounting.
- Foreign Exchange, Taxation Rules & Regulations.
- Financial Performance Evaluation & Risk Management.
- Cash Flow Management.

7.3.14 3-Month Skill Development Program on "Thermal Power Plant Operation"

Program Profile

- General Introduction: - Concept of Modern Thermal Power Plant, Location /Site Selection, Plant layout & Power Plant Safety.
- Constructional details and basic principles of large pulverized fuel Boiler and auxiliaries.
- Construction and working principles of Turbine and auxiliaries.
- Various types of Valves and Pumps.
- Construction and working principles of Alternators and Excitation Systems, Transformers, Motors, Switchboards, Power Supply System and Switchboard.
- Fuel Handling Plant, Ash Handling System and Cooling Water System.
- Water Sources and treatment.
- Operation, control and supervision of Boiler, Turbine and Alternator.
- Instrumentation & Control (including DAS & DDC) and Protection system. (Introduction)
- Power Plant Maintenance practices.
- Plant Visits.

7.3.15 MNRE sponsored Solar PV Installer "Suryamitra" for Diploma/ITI Holder

Program Profile

- Carry out the Site survey for installation of Solar PV system
- Assess the customer's Solar PV requirement.
- Procure the Solar PV system component
- Identify and Use the Tools and tackles used for Solar PV system installation
- Install the Civil/Mechanical and Electrical components of a Solar PV system
- Test and Commission Solar PV system
- Maintain Solar PV system
- Maintain personal Health & Safety at project site

Two-day pilot training program on rooftop solar installations held at Varanasi

7.4 SHORT TERM TRAINING COURSES (1 DAY TO 4 WEEKS)

Objective

The short term training programs are customized/ need based programs, specifically designed for working professional as well as induction level trainees. These programs provide and/or upgrade specific skills and knowledge required to enhanced performance of expected duties and responsibilities in a very short time span. Short term training programs are refreshers programs of durations 1 day to 4-weeks. These programs are benefiting the working professionals in the sector by upgrading themselves with the latest technological advancement in the sector in very short duration.

I POWER GENERATION AND ITS ANCILLARY EQUIPMENTS

7.4.1 Advanced O&M Practice of Supercritical Thermal Power Plant

Program Profile

- Flexible condition and operation practices.
- Pre-checks of plants equipment's.
- Plant Operation and unit stabilization.
- Critical parameter monitoring.
- Data Analogy and unit equipment health monitoring.
- Emergencies and critical operation conditions in plant.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.2 Flexible Operation of Thermal Power Plants in India

Program Profile

- Operational dynamics of thermal power plants.
- Design & Operational challenges in thermal power plants.
- Fuel characteristics viability for flexible operation in India.
- Plant load variability for sustainability of flexible operation.
- Recent advancement for flexible operation in supercritical and ultra-supercritical plants.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.3 Thermal Power Station Operation

Program Profile

- Power Station Schemes.
- Boiler and Turbine controls.
- Excitation systems and AVR.
- Cold, Warm and hot start-ups.
- Steam Turbine governing and protection systems, trouble shooting.
- Boiler, Turbine, Generator and Integrated unit operation under normal and emergency conditions.
- Unit shut down procedures and safety.
- Performance monitoring.
- Duties and responsibilities of operation engineers.

Who may attend : Engineers having 1-2 years experience in Thermal Power Stations.

7.4.4 Boiler Operation/ Boiler & Its Auxiliaries Operation

Program Profile

- Working principle, function and classification of Boilers.
- Description of Boiler components.
- Function and working principle of Boilers Auxiliaries- Mills & Feeders, fan, Air pre-heaters, soot blowers, etc.

Who may attend : Engineers having 1-2 years experience in Thermal Power Stations.

7.4.5 Boiler Firing System & Equipments

Program Profile

- Combustion of Fuels.
- Different firing systems – tangential firing, wall firing and down shot firing- their requirements and applications Igniters.
- Oil atomizers.
- Coal Burners.
- Burner Management system.
- Direct Ignition of Pulverized Coal.
- Operation Procedure, Maintenance.
- Trouble Shooting in firing system components.

Who may attend : Operation & Maintenance engineers of Thermal Power Station with 4-5 years experience.

7.4.6 Boiler Efficiency

Program Profile

- Different aspects of Efficiency measurements and measurement procedures.
- Boiler tuning for load ramping and condition of boiler Efficiency at various loading.

- ASME PTC 4.0 sailent features of boiler performance checks.
- Case studies to improve boiler performance parameters.

Who may attend: Efficiency & Operation Engineers, system performance Managers, who are having prior knowledge of various tools and technical measurement system for boiler performance / operation / commissioning. This is an executive (Technical) program aimed for professional power engineers.

7.4.7 Renovation & Modernization of Thermal Power Plant/Station

Program Profile

- Norms for renovation & Thermal Power Station & Funds allocation.
- Scope of renovation & area of renovation.
- Renewal life Assessment Techniques for Turbine, Boilers and generator.
- Life extension studies and techniques for Thermal Power Station auxilliary.
- Stress Analysis and data interpretation.
- Case Studies.

Who may attend: Middle Level Managers/ Working Engineers with 2 to 3 years experience.

7.4.8 Steam Turbine & Its Aux. Operation

Program Profile

- Constructional features of turbine, turbine auxiliaries like condenser, pumps, feed heaters etc.
- Operational procedure of associated systems such as condensate, feed, lube oil, CW etc. On line cleaning system, Operation of boiler feed pump and condensate extraction pump.
- Interlock protection of turbine and its auxiliaries.
- Starting and shutting down of turbine.
- Operation of turbine under normal and emergency conditions.
- Emergencies & case studies.

Who may attend: Engineers with 3-4 years experience in Thermal Power Station.

7.4.9 Steam Turbine Governing

Program Profile

- Introduction to Governing System, Concept of Nozzle Control and Throttle Control.
- Hydrodynamic Governing of LMW Turbine, Speed Governor and Follow Up Piston.
- Governing Oil System, Load cum Speed Governor.
- Summation Pilot Valve, Intermediate Pilot Valve and Servomotor of Nozzle.
- Control Valves, Protection of LMW Governing System
- EHG and MHG of KWU Governing System.
- Concept of Minimum Gate Principle and Electro-Hydraulic Converter and Hydro-Hydraulic Converter.
- Application of Different Governing Oils of KWU System.
- Follow Up Piston and Development of Secondary Sensitive Oil and its Application.
- Protection System of KWU Governing System and its Application on Different Modes of Start Up.
- Application of Governing System in Accordance with HP/LP Bypass System.
- Concept of Digital Electro-Hydraulic (DEH) Governing System of Chinese Units.
- Application of High Pressure Governing Oil in DEH System.

Who may attend: Working Engineers of Thermal Power Stations.

7.4.10 Generator & Auxilliaries Including Excitation System

Program Profile

- Generator construction and design aspects.
- Generator characteristics, synchronization & parallel operation
- Generator protection.
- Excitation & AVR-various types and their selection aspects.
- Problems faced.
- Case studies.

Who may attend: Engineers with 2-3 years experience in erection, commissioning operation and maintenance of generator system.

7.4.11 Emerging Trends in Excitation System & AVR

Program Profile

- Excitation System - Introduction, Types, Selection and Salient Features.
- Static Excitation System – Construction, operational Features and Case Studies.
- Brushless Excitation System – Description, operational Features and Case Studies Developments in AVR and Limiters.

Who may attend: Engineers with 2-3 years experience in erection, commissioning operation and maintenance of generator system.

7.4.12 Thermal Power Plant Efficiency & Performance Monitoring

Program Profile

- Steam cycle theory and optimization.
- To identify and record the factors and data needed for monitoring efficiency and performance.
- Analysis of the performance of different systems and equipments like station heatbalance, mill performance, condenser performance, feed heaters performance, boiler efficiency, turbine efficiency etc.
- Corelation among different systems and their effect on performance.
- Application of computer for performance calculation and analysis.
- Improvement of plant availability through efficiency and performance monitoring.
- Plant on-job/practicals.

Who may attend : Power Station Engineers having 2-3 years experience in operation and maintenance.

7.4.13 Large Capacity CFBC Boilers

Program Profile

- Introduction to CFBC Technology Advantages, Scope, Fuel flexibity, etc.
- Description of various components of CFBC Boiler.
- Environmental benefits.
- Limitations, major concerns in the O&M of CFBC Boilers.
- Visit to CFBC Boilers.

Who may attend : Engineers working in Power Stations.

7.4.14 Regenerative Feed Heating System

Program Profile

- Different types of heater – H.P. & L.P.
- Theory of heating, construction of HP & LP heaters.
- System of steam extraction.
- layout of system – various considerations.
- Operation of the individual components.
- Cutting in and cutting out procedures of heaters.
- Performance monitoring of heaters and identification in the system.
- Various interlocks and protections and Automatic systems.

Who may attend : Operators working in Thermal Power Station with 3-4 years experience.

7.4.15 Fans & Air Heaters

Program Profile

- Fans: Different types of fans and their applications, engineering, design and selection criteria.
- Construction details and components description for different types of fans.
- Fan operation techniques in series/ parallel conditions.
- Fan characteristics and performance monitoring.
- Condition Monitoring: Vibration measurement, rubbing sound measurement and other diagnostic studies.
- Fan maintenance procedures and practices.
- Air Heater: Different types, their design construction and selection aspects etc.
- Alignment & Adjustment Techniques of seals.
- Lubrication.
- Problems-Case studies and analysis.

Who may attend : Engineers with 1-2 years of experience in O&M of Boilers/ auxilliaries in a Thermal Power Station/ Industry.

7.4.16 Electrostatic Precipitator

Program Profile

- General discussion on pollution.
- Types of ESP & selection aspects.
- Principles of construction & functioning of ESP.
- Corona and Ionization.
- Description of Dust precipitator.
- Installation, Operation and Maintenance of ESP.
- Mechanical Parts Maintenance.
- Electrical control circuit maintenance and checking. Efficiency and performance of ESPs and Factors affecting the performance.

Who may attend : Engineers engaged in operation and maintenance of power station & process industry with2-3 years experience.

7.4.17 Valves & Pumps in Power Plants Engineering

Program Profile

- Description of different types of Pumps and their construction, Selection & Operational aspect.

Who may attend : Operators/Technicians working in Thermal Power Plant.

7.4.18 Operation & Maintenance (O&M) of Coal Mills & Feeders

Program Profile

- Description of different types of Mills & Milling system components such as Raw Coal Feeders, Classifiers and variators etc. their design, construction and selection aspects.
- Description of Coal grinding Principles and grinding elements.
- Frequently eroding parts and eroding characteristics analysis.
- Proper maintenance techniques and replacement procedures of eroding parts.
- Driving Mechanisms and their maintenance procedures.
- Lubrication and sealing system.
- Maintenance planning for Milling system.
- Routine Maintenance and Breakdown Maintenance of Milling Plant.
- Overhauling of Milling Plant.
- Preventive measures for stopping erosion of Pulverized Coal lines bends and their proper alignment.

Who may attend : Engineers with 2-3 years experience in Operation and Maintenance in a Power Station.

7.4.19 Vibrational Analysis

Program Profile

- Introduction to Machinery vibration.
- Basic machinery vibrations.
- Machine vibration analysis.
- Balancing of rotating machinery & Alignment technologies.
- Advanced vibration analysis.
- Advanced vibration control.
- Practical rotor dynamics & modelling.
- Vibration measurement.

Who may attend : Engineers/ Research Scholars.

7.4.20 Trouble Shooting of Steam Turbine

Program Profile

- Details of Steam Turbine, bearing and its Lubrication.
- Turbine dynamics and vibration theory.
- Causes of Vibration in Turbine and Case Studies.
- Measurement and interpretation of vibration signatures.
- Condition Monitoring and Performance Monitoring.
- Types of turbine Failure and its remedy.

Who may attend : Engineers from SEBs/Power Utilities/ corporations with 2-3 years of experience.

7.4.21 Reliability Centered Maintenance of Rotary Equipments

Program Profile

- Introduction to Reliability Centered Maintenance (RCM); steps and benefits of RCM.
- First approach to RCM-Functions, failure and significant of Rotary equipments, consequences of failure as per RCM.
- Reliability centered maintenance tasks for Rotary equipments.
- Condition monitoring of rotary equipments-as an important role for RCM.
- Description of condition monitoring equipments.
- Description of vibration and signature analysis.
- RCM recording systems and documentation system.
- Preventive maintenance techniques of pumps, fans, turbine and other rotary equipments.
- Overhauling job schedule for the above mentioned equipments.
- Trouble shooting and failure diagnosis of rotary equipments.
- Bearings, Lubrication and tribology.
- Balancing and Alignment of rotary equipments.

Who may attend : Experienced Engineers working in Power Plants, Utility Industries and other Industries.

7.4.22 Non-Destructive Testing & Welding Defects

Program Profile

- Introduction to Non Destructive Testing Procedures.
- Welding defects and associated Non Destructive Testing Methods.
- Types of material defects.
- Various NDT Techniques and their Applications.
- Dye Penetrant Test.
- Magnetic Participle Test.
- Ultrasonic NDT Methods.
- Ultrasonic Flaw Detectors.
- Eddy Currents Non Destructive Testing.
- Radiography & Test Applications.
- Applicable ASTM Standards.
- Various Types of weldings Defects & Preparation of Welding Procedures in various positions as per AWS.

Who may attend : Engineers/Supervisors with one or two years relevant experience may attend.

7.4.23 Electrical Motor for Power Plant & its Maintenance

Program Profile

- Theory of different types of motors.
- Constructional details of different types of motors.
- Terminal connections and terminal box.
- Mounting/Enclosures, insulation material used in motors.
- Stripping down seven inspections of motors.
- Cleaning and inspection.
- Bearings used in motors.
- Assembling, testing and commissioning.
- Problems of motor-case studies.

Who may attend : Maintenance technicians with 2-3 years experience with basic knowledge of electricity upto ITI Standard.

7.4.24 Fan & Air Heaters Maintenance

Program Profile

- Classification of Fans and Air heaters and their applications in thermal power stations.
- Constructional details, operation and maintenance techniques of different Fans & Air Heaters.
- Causes of erosion, corrosion, vibration and their remedies. Load regulating system of Fans.
- Problems of Fan & Air heaters – Case Studies.

Who may attend : Technicians working in power station with 2-3 years experience.

7.4.25 Bearing Maintenance and Shaft Alignment

Program Profile

- Classification of Bearings.
- Inspection of Bearings.
- Bearing materials.
- Friction and its effect on bearing performance.
- Top side gaps adjustments of sleeve/ bearings/ journal grooving on plain bearings, scrapping of journal bearings selection of bearing lubrications and their purification.
- Handling and Storage of bearings.
- Care and maintenance of plain bearings, Anti friction bearings.
- Types of coupling and their uses.

Who may attend : Maintenance technicians with 2-3 years experience in the relevant field.

7.4.26 Pump Maintenance

Program Profile

- Description of different types of pumps, their construction, operation and applications.
- Single stage horizontal.
- Double stage vertical, Multi stage horizontal.
- Gear pump: Description of associated parts (fixed and movable)
- To acquaint the trainees with essential maintenance procedures like: Gland packing.
- Bearing removal and inspection, coupling design.
- Clearance and renovation of wear-rings impellers.
- Correct use of tools.
- Inspection of parts for wear and tear.
- Inspection of parts for wear and tear.
- Use of measuring instruments.
- Producing a joint for replacement.

Who may attend : Maintenance Technicians with 2-3 years experience in the relevant field.

7.4.27 Condition Based Maintenance Aspect of Electrical Equipments

Program Profile

- Maintenance: Introduction, Types, Scheduling, Testing and Requirement of CBM.
- Online monitoring system of Rotating Machines including Partial Discharge Monitoring for Stator Windings and Rotor Flux Monitoring System for Turn Shorts and Case studies.
- On Line Vibration Monitoring System and Case Studies: Turbo Generator & HT Motors.

Who may attend : Engineers with 2-3 years experience.

7.4.28 Valve and Pump Maintenance

Program Profile

- Description of different types of valves, their construction, operation and applications.
- Correct use to tools, Dismantling.
- Identifying the types of valves.
- Replacement of worn out or damaged parts.
- Description of different types of pumps, their construction, operation and applications.
- Single stage and multi stage centrifugal pump.
- Maintenance of BFP & CEP.
- Trouble Shooting.

Who may attend : Engineers from SEBs/Power Utilities/ corporations with 2-3 years of experience in relevant field of power station.

7.4.29 Pumps Operation, Maintenance and Performance Monitoring

Program Profile

- Different types of pumps, their application & selection criteria for Power Station.
- Theory & working principles of different type of Pumps.
- Design & selection aspects and construction of boiler feed pump.
- CW Pumps.
- Special aspects of positive displacement Pumps.
- Components material selection for pumps installation & commissioning.
- Operation & trouble shooting.
- Maintenance Aspects.
- Pump Characteristics on series/parallel operation.
- Performance assessments techniques & Monitoring Case Studies.

Who may attend : Engineers of Power Plant & Industry.

7.4.30 Valve Maintenance

Program Profile

- Description of different types of valves, their construction, operation and applications.
- Correct use of tools, Dismantling.
- Identifying the types of valves.
- Replacement of worn-out or damaged parts.
- Use of correct lapping discs.
- Overhaul and maintenance of cover joints and bonnet joints.
- Correct method of cutting & jointing.
- Overhauling of valves.
- Hydraulic testing of valves.

Who may attend : The course is for technicians with 2-3 years experience in relevant field of Power Station.

7.4.31 Boiler Tube Failure and Case Studies

Program Profile

- Types of Boiler Tube Failure and their classification.
- Causes of different types of tube fails and their analysis.
- Understanding and locating tube failure by operational parameters at running condition.
- Job involvement for physically locating the tube failure at shut down condition.
- Tube failure rectification.
- Control of boiler tube failures.
- Different case studies.

Who may attend : Engineers working in Thermal Power Plant & other industries who deal with boiler (either operation or maintenance or both).

7.4.32 Welding Practices

Program Profile

- Different types of welding and their processes.
- Gas welding – techniques, equipments used, choice of flames, flux & filler metals, gas welding joints.
- Oxy-fuel Gas Cutting-Process, techniques and equipments used.
- Shielded (Coated) Metal Arc Welding (SMAW) techniques machines & equipments used, joints design, classification and proper selection of electrodes.
- High Pressure Welding-TIG welding and its techniques, power sources & equipments used.
- MIG/MAG Welding—Techniques, equipments, accessories, shielding gases, filler rods.
- Welding Techniques for ferrous and nonferrous metals.
- Welding Defects, NDT, Heat Treatments.

Who may attend : Operator working in Thermal Power Station with 3-4 years experience.

7.4.33 Advanced Welding and Testing Technologies

Program Profile

- Introduction to welding and different welding process.
- Need for inspection and testing of welding - Stages of inspection.
- Testing methods for detecting external & internal flaws.
- Types of weld surface defects – its causes and remechal measures.
- Application of NDT and DT Eddy current testing Techniques.
- LPT, MPT, RFI, UT.
- Interpretation & Evaluation of Indicators.
- Test Procedure & Standards.

Who may attend : Engineers/ Managers/ Researcher from Utilities.

7.4.34 Power Plant Chemistry for Operation Engineers

Program Profile

- Corrosion/depositions in Boiler, Steam Turbine condensers and their prevention techniques.
- Acid cleaning of boiler/condensers etc.
- Unit preservation during idle time.
- Characterization of coal for the power plant.

- Optimization of combustion.

Who may attend : Operation Engineers with experience as Shift In-charge Engineers/ Operation Engineer.

7.4.35 Best Practices in O&M of Air Compressor

Program Profile

- Instrument air System – Components – Principle of working – Reciprocating Air compressor- Lubrication & Cooling System
- Performance & Efficiency of Compressor- vLeaks – Control strategy Energy Audit & Energy saving Methods
- Best Practices in operation of Compressor- Start-up & Stop – Loading & Unloading Characteristics
- Best practices in Maintenance of Compressor- Condition Monitoring – Pulsation & Vibration – Case Studies

Who may attend : Supervisors/Technicians /Engineers Working in Utilities/Power Plants with 2- 3 Years' Experience

7.4.36 Super Critical Power Plants – Innovations & Case Studies

Program Profile

- Efficiency improvement in supercritical power plants
- Material development for pressure parts
- Diversification of Alloy material reliability improvements
- Supercritical power plants operation dynamics improvement
- Case studies for reliability improvements
- Case studies for efficiency improvements

Who may attend : Engineering/Diploma Graduates Students/Power Plant Working Professionals (Junior and Middle Level Managers/Executives/officers).

II. HYDRO POWER AND RENEWABLE ENERGY SYSTEMS

7.4.37 Small, Mini and Micro Hydro Power Generation

Program Profile

- General Principles & Theory.
- Introduction of small, mini and hydro power generations.
- Hydrology and estimation of water potential.
- Basic features of hydro Turbines.
- Plant visit.

Who may attend : Engineers working in Hydro Power Plants.

7.4.38 Hydro Turbines, Governing & its Protection Systems

Program Profile

- General Principles and description of different type of governing systems. Speed control devices and wicket gate operation.

Who may attend : Engineers working in Hydro Power plants.

7.4.39 Hydro Generator & Its Excitation Systems

Program Profile

- Constructional details and working principles of Generator and excitation systems. Types of Excitation systems and their components main and iplot exciters, Thyristor, FCB & AVR.

Who may attend : Engineers/Sr. Engineers working in Hydro Power Plant.

7.4.40 Valves & Pumps in Hydro Power Plants

Program Profile

- **Hydro Plant Valves:** Constructional details and features of valves and their types (Butterfly, Spherical, Needle etc).
- **Hydro Plant Pumps:** Constructional details and working principals of various types of pumps used in H.E. stations and their operation & control system.

Who may attend : Working professionals from hydro power station.

7.4.41 Auxiliaries in Hydro Power Plants

Program Profile

- **Electrical Auxillaries:** station lighting and automatic changeover. Station batteries and charging methods. Station emergency lighting arrangements, Elevator/lifts, Ventilation system, EOT cranes and hoists, Compressed air system, Dewatering and drainage system, Communication systems etc.
- **Mechanical Auxillaries:** Oil pressure units, Lubrication principles and their characteristics, HP lubrication system, Braking and jacking system, Central release lubrication system, Carbon dust collection system for slip rings, exciters and brake pads, Cooling water system etc.

Who may attend : Engineers/Shift Engineers/Operators working in hydro power plant.

7.4.42 Hydro Power Plant Operation

Program Profile

- General principals of Hydro machine start and stop procedure and sequence. Operation of modern Hydro power station & features of pumps storage plant. Generator-Synchronizing, loading, parallel operation, active and reactive power sharing and frequency control, operation during emergency conditions. Declared capacity, scheduling & ABT based system UI, CI etc.

Who may attend : Engineers/Shift Engineers/Operators working in Hydro Power Plant.

7.4.43 Specialized Training Programme on Hydro Power Plant Engineering

Program Profile

- Class room session.
- Concept of modern hydro power plant.
- Site selection, components and layout.
- Description of Hydro Power plant components & Operational aspects.
- Plant visits at Hydro Power Plant sites.
- Hydro Power Plant Simulator.

Who may attend : Newly recruited and working engineers & supervisors in hydro power station (Mechanical, Electrical & Instrumentation).

7.4.44 Solar Power Technologies

Program Profile

- Introduction to JNNSM.
- Solar PV.
- Solar Thermal.
- Wind Power.
- Bio-Mass Power.
- Waste to energy.

Who may attend : Engineers with 2-3 years experience.

7.4.45 Entrepreneurship Development Program on Solar PV Rooftop

Program Profile

- Provide basic information on solar PV Rooftop and raise awareness amongst entrepreneurs on the following.
- Concept, design and components with specific focus on technical architecture of solar PV rooftop system.
- Policy and regulatory framework for Solar PV Rooftop at the national and state level.
- Business models followed in the solar PV Rooftop market and role of respective stakeholders.
- Provide specific information to the entrepreneurs on Solar PV Rooftop project costing and financing, Preparation of feasibility reports.

Who may attend : Science Graduates, Engineering Graduates (Mechanical, Industrial, Production, Electrical and Electronics), Management Graduates (Preference will be given to Science and Engineering Graduates).

7.4.46 Solar PV (Photovoltaic) System Design and Installation

Program Profile

- Classroom Topics.
- World Energy Scenario and Indian Perspective, Renewable Energy Technologies, Role of Solar PV and policies in India, Basics of Electricity, Introduction to Instruments.
- Introduction to Solar Radiation, Optimum orientation of Solar PV modules, Solar related measuring devices.
- Solar PV Electricity, Introduction of Solar PV Modules, Interconnections of PV Modules, Impact of environmental parameters on module performance.
- Introduction to Battery technologies, Charge controller, MPPT, Solar PV inverters.
- Types of Solar PV systems, Introduction to Solar PV system design.
- Grid Solar PV system design with DC load, Grid Solar PV system design with water pump, Example of Solar Power packs for homes/industrial applications, Example of Solar Power packs for homes/ industrial applications.
- Design of Grid, Connected Solar PV systems
- Wires and Cable sizing, Junction Boxes, Combiner Boxes, Fuses, etc.
- Solar PV system Installation, Monitoring and Trouble Shooting, Introduction to Solar lamps, Solar Products available in the market.
- Proposed Laboratory Experiments: Solar Radiation Measurement, Measurement of PV module parameters, Series and Parallel connections of modules, Inverter, Rectifier and Transformer, Measurement of Battery, Charge Controller and Inverter parameters, Testing of Standalone PV system.
- Proposed Field Sessions: PV Panel Assembly, PV String Assembly, Grid connected PV Plant Assembly and Testing, PV plant Operation and Maintenance checks, Solar PV Modules/ BoS components manufacturing site visit.

Who may attend : Newly recruited and working engineers & supervisors in solar PV power station (Mechanical, Electrical, Electrical & Instrumentation).

7.4.47 Solar Power Generation Technology - On Grid & Off Grid

Program Profile

- Overview of renewable energy in India – Feasibility studies.
- Introduction to PV Technology Basic of Solar Cell & PV modules – Engineering Process Technology.
- Solar Charge Controller – Types, Basic of Solar Inverter.
- Introduction to SPV Design: Types of SPV system & their components.
- Basic Understanding of SPV System Integration.
- On grid / hybrid / grid-interactive SPV System.
- SPV Project implementation, basic criteria, requirements, standards & Procedures.
- Manufacturing Technology of Solar PV Modules.

Who may attend : Engineers and Jr. Engineers with 1-2 years of experience.

7.4.48 Solar PV Panel - Installation, Maintenance and Testing

Program Profile

- PV System Configuration.
- Site Selection.
- Module Selection.
- Selection & Inverter.
- Generator Junction Box & DC Main Switch.
- Safety Measures - Mounting System.
- Grid Interface.

Who may attend : Technician/Diploma/Degree holders.

7.4.49 Hybrid Renewable Energy Systems (HRES)

Program Profile

- Integral components of Hybrid renewable energy system and its configuration.
- Optimization modeling of hybrid renewable energy system
- Sustainability and reliability of HRES.
- Economic energy storage solution of HRES.
- Cost economics of HRES.
- Constructional and operation challenges of HRES system.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.50 Condition Monitoring of Hydro Turbine Generator Set

Program Profile

- Operation of hydro power Station & there features,
- Generator synchronization and parallel operation,
- Active and reactive power, sharing between the power station,
- Operation during emergency condition,
- Monitoring and controlling of the operational parameters during normal and abnormal operating condition including ABT best system UI charges etc.,
- Case studies.

Who may attend : Working Professionals from Power Sector, Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.51 Capability Curve and Reactive Power Control of Hydro Generators

Program Profile

- Generator characteristics and capability curve
- Excitation and ABR
- MW, MVAR Control
- Case studies

Who may attend : Working Professionals from Power Sector, Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.52 Control and Instrumentation in Hydro Power Plant

Program Profile

- UNIT AUXILARIES: Guide bearing and shaft seal arrangements, Oil pressure units, HP lubrication system, Braking and jacking system, Central grease lubrication system, Carbon dust collection system from slip rings, exciters and brake pads, Cooling water system
- Constructional details and working principles of Francis turbines and auxiliaries: Principle of operation, types and characteristics of turbines.
- Type of Governors - Hydraulic and Electronic. Working Principle.
- Constructional details and working principles of Synchronous AC Generator.
- Generating Transformer: Constructional details and its principle of operation. Generator Transformer connections
- Switchyard and its equipment

- Significance of C&I for Hydro Power Plant, Process Control Philosophy.
- Concepts of Close and Open Loop Controls, Proportional, Integral and Derivative Controllers.
- Measurement Techniques for Pressure Parameters
- Measurement Techniques for Temperature Parameters.

Who may attend : Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.53 Hydrology Studies in Hydro Power Plant

Program Profile

- General Requirement of Hydropower Schemes
- Remote Sensing/GIS in power Sector
- Water Availability and Flow Duration Curves
- Preparation of DPR for Water Resources Projects
- Impact of climate change on hydropower

Who may attend : Working Professionals from Power Sector, Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil, Instrumentation and Electronics.

7.4.54 Tunnel and Tunneling Concept in Hydropower Project

Program Profile

- Tunnel Geology for site selection and advanced geological forecasts
- Tunnel engineering & Design Aspects including seismic issues including BIM etc.
- State-of-the-art concept of TBM Tunneling
- Case studies during Tunneling
- Precast Lining segments
- Concept of Immersed Tunnels and Tunnel in Himalayas
- Escape tunnel, Ventilation shaft and Cross passages
- Preparation of TBM Tunneling and associated Launching arrangement
- Structural monitoring system in tunnels through Instrumentation and new technologies
- NATM tunneling
- Various Equipment's used in Tunneling
- Water proofing & Codal Provisions of Tunneling
- Safety & Quality Aspects in Tunneling
- Panel Discussions

Who may attend : Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.55 Major Civil Structure and its Maintenance in Hydropower Plant

Program Profile

- Design flood estimation of hydro power project
- Geospatial and hydrological modelling to access hydro power potential zone and side location
- Geospatial information sport for power project
- Impact of climate change on hydro power
- O&M of major civil starchier
- Problem faced and case studies

Who may attend : Working Professionals from Power Sector, Degree/Diploma EngineeringElectrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.56 An Overview of Solar Thermal Technology

Program Profile

- Introduction about Solar Thermal Technology, present power scenario in India
- SWOT analysis of Solar Thermal Technology
- Latest technologies
- Economic Analysis

Who may attend : Working Professionals from Power Sector, Degree/Diploma/Engineering Mechanical Engg., Power Engg., Electrical & Electronics, Instrumentation and Electronics, Electrical Engg.

7.4.57 Solar Photovolltaic Power Plant Integration with Grid and Storage Batteries

Program Profile

- Overview of renewable energy in India-Feasibility studies.
- Introduction to PV Technology Basic of Solar cell & PV modules Engineering process Technology.
- Solar charge controller –types Basic of Solar Inverter.
- Introduction to SPV Design; types of SPV system & their components.
- Basic understanding of SPV System Integration.
- On-Grid/Hybird/Grid-interactive SPV System.
- SPV Project implementation, basic criteria requirements, standards & Procedures.
- Manufacturing Technology of Solar PV Modules.
- Field Visits. Lectures, lab sessions

Who may attend : Working Professionals from Power Sector, Degree/Diploma/Engineering Mechanical Engg., Power Engg., Electrical & Electronics, Instrumentation and Electronics, Electrical Engg.

7.4.58 Advance O & M Techniques in Hydro Power Plants

Program Profile

- Operation & Predictive, Preventive and emergent maintenance of Turbine & auxiliaries.
- Generator & Excitation system, Power Plant Auxiliaries Operation & Transformer

Who may attend: Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers.

7.4.59 Best O & M Practices of Hydraulic Gates in Hydro Electric Plant

Program Profile

- Hydro Mechanical components.
- Constructional details and selection criteria of Hydro Mechanical Gates.
- Inspection and Testing procedure for Hydro Mechanical Equipment's.
- Best O&M practices of Hydro Mechanical Gates & Hydraulics.
- Preventive & annual Mtc. of Gates.
- Butterfly and Needle valve and hydraulic components.
- Best Mtc. practices of Hydro Mechanical Gates & Hydraulics.
- Constructional details and Mtc. of Spherical/ Butterfly and Needle Valves.
- Feed Back Session

Who may attend: Working professionals

7.4.60 Green Energy for Clean Environment/ Green Energy Technologies

Program Profile

- Issues and Challenges for development of Green Energy in India.
- Current Technologies for Green Energy Development.
- Regulatory Framework for Green Energy in India.
- Green Energy Corridors.
- Greening the Grid Report.

Who may attend: Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering and Science Graduates and Entrepreneurs.

7.4.61 Development of Floating Solar PV System (FSPV) in India

Program Profile

- Concept note and design documentation for FSPV
- Constraints and challenges in FSPV system.
- Layout and materials integration plan.
- Challenges in erection and commissioning, Testing.
- Integration and water saving potential of FSPV System.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.62 Waste to Energy : Green Energy Development

Program Profile

- Waste characteristics analysis.
- Waste generation analysis.
- Waste to energy : Technology selection.
- Environment norms for plant.
- Commercial aspect and tariff structure of waste to energy.
- Case studies of waste to energy plant.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.63 Skill Development Program on Renewable Energy

Program Profile

- Solar Energy conversion (Photovoltaic, Thermal and combination of both).
- Wind power and its generation of electricity, applications and future scopes.
- Biomass energy utilization, conversion technologies (Thermo chemical, bio-chemical).
- Biofuels (biodiesels, biogas, producer gas and natural gas) their production and utilization.
- Hydro-electric power generation and its different types.
- Hybrid energy system.
- Energy Storages.
- Cost analysis of different clean technologies.

Who may attend : Engineers/Faculties/ Research Scholars/ PG students.

III. TRANSMISSION AND DISTRIBUTION SYSTEM

7.4.64 Power System Studies

Program Profile

- Load flow: Modeling and case studies.
- Short circuit studies; Z bus matrix and symmetrical components.
- Balanced and unbalanced faults and case studies.

- Over current relay coordination-case studies.
- Stability studies-modeling case studies.
- Laboratory : Use of MiPower software.
- Field visits.

Who may attend: Transmission and distribution engineers involved in system design, planning, protection and control, engineers from R & D organizations and Academic institution.

7.4.65 Power System Studies & Load Despatch

Program Profile

- Growth of power system in India.
- Representation of power system components.
- Characteristics & performance of power transmission lines.
- Load flow studies and problems.
- Different types of faults and their analysis by computer methods.
- Power system protection devices.
- Power system stability.
- Load Despatch and its computerization.

Who may attend : Engineers of Power Sector engaged in power system and load dispatch centres.

7.4.66 Flexible AC Transmission System (FACTS)

Program Profile

- Introduction.
- Thyristor Controlled FACTS devices - Static Var Compensator (SVC), Thyristor Controlled Series Capacitor (TCSC), Thyristor Controlled Reactor (TCR).
- Phase Shifting Transformer.
- Voltage Source Converter based FACTS controllers-STATCOM, Static Synchronous Series Compensator (SSSC), Unified Power Flow Controller (UPFC).
- HVDC.
- Applications of FACTS.
- Tutorials.
- Technical Visits.

Who may attend : Practicing engineers involved in planning, design and implementation of FACTS devices.

7.4.67 HVDC Transmission Systems

Program Profile

- Introduction to HVDC.
- Principles of HVDC Conversion.
- HVDC Lines.
- HVDC Sub Stations.
- Reactive Power Management in HVDC Stations.
- AC & DC harmonics and filtering.
- HVDC System operation, Insulation Coordination, Emergencies and case studies.
- HVDC System operation Control and maintenance
- Field Visits.

Who may attend : Practicing engineers from generation, transmission, distributed systems, industrial and other consumers of electricity, electrical inspectors and electrical consultants.

7.4.68 Operation & Maintenance (O&M) of Transmission Lines & Sub-station

Program Profile

- Transmission and Distribution - a business mission.
- Operation Procedures and practices of Transmission line and Sub-Station.
- Equipment inspection and Selection aspects.
- Equipment Failure analysis and its maintenance.
- Maintenance of Sub-Station equipments.
- Hot line Maintenance and ERS of Transmission line.
- Routine, Preventive and breakdown Maintenance.
- Protection System and its equipment.
- Safety aspects and fire protection devices.

Who may attend : Engineers with minimum 2-3 years experience in O&M of Transmission and Distribution or Power Station.

7.4.69 Operation & Maintenance (O&M) of HT/LT Switchgear

Program Profile

- Types of Switchgears.
- Selection Criteria for Switchgears.
- Design & Construction Data.
- Erection/Commissioning.
- Check-list and precautions.
- Fault finding.
- Testing procedures & Equipments.
- Case Studies.

Who may attend : Engineers with 2-3 years experience in switchgear electrical installation of industry.

7.4.70 High Voltage Testing of Power System Equipment

Program Profile

- High voltage technology.
- Solid insulating media, liquid insulation media.
- Gas & Vacuum Insulation.
- Generation of high voltage for testing.
- High voltage measurements.

- High voltage testing of transformers.
- Testing of Circuit Breakers.
- Testing of Surge arrestors.
- Testing of Insulators, Cables, Capacitors.
- High Power Testing of switchgear.
- Partial Discharges.
- Field visits.

Who may attend : Engineers involved in procurement, installation and testing of power system equipment's.

7.4.71 Operation & Maintenance (O&M) HVDC Transmission Systems

Program Profile

Performance improvement of HVAC Transmission Systems depends on various factors like voltage rating, area location, type of tower, loading, design and technology of various hardwares. It also depends on methods of monitoring and maintenance technique used.

- Various issues & challenges in Transmission systems.
- Types of Tower, various hardwares & fittings.
- Methods of Monitoring.
- Types of faults & causes.
- Thermo-scanning, etc.
- Improved Transmission Monitoring (WAMS) using PMU/PDCs.
- Better coordination between transmission and distribution (Grid Discipline).
- Maintenance of transmission line.
- Live/hot line insulator cleaning and replacement.
- FACTS devices.
- Methods of reduction of AT & C losses.

Who may attend : Engineers, Technicians & personal working in Transmission & distribution utilities.

7.4.72 Power System Energy Losses

Program Profile

- Growth of power system in India.
- Transmission Losses.
- Distribution losses/transformer losses.
- HT metering.
- Remedial measures to minimize various system losses.
- Energy management system, Flattening of load demand, Energy auditing and reporting techniques.
- Power System Planning, economic operation, maintenance to minimize losses.
- Computer application in Power System.

Who may attend : Assistant Engineers/ Executive Engineers/Superintending Engineers working in transmission & distribution.

7.4.73 Project Management of EHV Lines & Towers including Sub - Station

Program Profile

- Project management Techniques for Transmission Line Projects.
- Software methods for Project preparation and control etc.
- Financial Implicztions of Project Management.
- Site Survery, detaioled survey, Foundation work etc.
- Estimation of EHV Lines work, Sub-Station etc.
- Construction of EHV Lines and Tower and Sub-Station
- Commissioning ofLines and Sub-Station etc.
- Sub-Station visit.

Who may attend : AE, Dy. EE, EE of Transmission Utility & Project Personnel from Contractor Company.

7.4.74 Distribution Engineering

Program Profile

- Growth
- Development
- Equipment
- Standards specification
- Construction Practice
- Guidelines
- Design aspects-testing
- Installation of Distribution Equipment
- Layout of Sub-Station.

Who may attend : Engineers engaged in distribution of electricity with 2-3 years experience.

7.4.75 Distribution Automation

Program Profile

- Design of LT Distribution System.
- LT distribution System - Feeder Reconfiguration and Transformers Load balancing.
- Customer Site Automation function: Load Control.
- Remote Meter Reading.
- Time-of-use rates.
- DTS Lab Voltage/ Var Control using Capacitors.
- Regulators.
- LTC.
- Equipment for Feeder Automation and Customer Automation.
- Digital Protection of Substation and feeders
- Remote connect/ disconnect.

- System Level Function: Fault Location.
- Isolation and service restoration.

Who may attend : Engineers engaged in distribution of electricity with 2-3 years experience.

7.4.76 Transformers

Program Profile

- Standardization & Specifications of transformers used in Power station.
- Selection of transformer, protection & schemes of protection and testing.
- Types & causes of Transformer failures.
- Testing of solid dielectric.
- Testing of liquid dielectric, standards.
- Predictive maintenance of failures.
- Dissolved gas analysis techniques.
- Case studies on transformer breakdown.
- Drying of Transformers.

Who may attend : Engineers with 3-4 years experience in the relevant field.

7.4.77 Condition Monitoring Residual Life Assessment (RLA) & LE of Substation Equipment

Program Profile

- RLA – Objective and Methods.
- Testing procedures and Methodologies.
- RLA of Oil filled transformers.
- RLA of Instrument Transformers.
- RLA of circuit breakers.
- RLA of other sub station switchgear.
- RLA of power cables.
- Testing and calibration of substation meters.
- Field Visits.

Who may attend : Engineers from State Electricity Boards, Power Utilities /Corporations, R & D organizations, Academic institutions.

7.4.78 Substation Planning & Engineering

Program Profile

- Planning of substation & Preparation of Project Report.
- Layout of Substation, Choice of Switching Schemes and Bus Bar/Bay Design.
- Selection of Substation Main Equipment.
- Design Cosideration of Substation Equipment and Earthing.
- Electrical Clearances and pre-commissioning Inspection.
- Over Voltages & Selection of Surge Arrestors.
- Engineering of Protection System for Substation.
- Cost estimates of Sub-Station and Case Study.
- Measurement of Soil Resistivity.
- RPC System.
- Metering in Sub-Station.
- Sub-Station Automation.
- Case Study.
- Field Visits.

Who may attend : Engineers from State Electricity Boards, Power Utilities/ Corporations, R & D organizations, Academic institutions

7.4.79 Power System Protection

Program Profile

- Fault analysis.
- Relay input sources.
- Protection of Generators & motors.
- Protection of bus bars.
- Protection of Transformers.
- Protection of EHV lines.
- Protection of Distribution systems.
- Protection against over voltages.
- Insulation Co-ordination.
- Testing of Surge Arrestors.
- Testing & commissioning of relays.
- Present trends in protection
- Case Studies.
- Laboratory Sessions.
- Tutorials.
- Field visits.

Who may attend : Engineers from state Electricity Boards, Power Utilities/ Corporations, R & D organizations, Academic institutions.

7.4.80 Advanced Power System Protection

Program Profile

- Overview of System Protection.
- Numerical Relays.
- Protection of Transformers, Transmission lines, Bus bars, Feeders.
- Integrated Protection, Control & Monitoring.
- Intelligent electronic Devices in System Protection.
- Software architecture and performance characteristics of numerical relays.
- Wide Area Protection.
- Video Sessions.
- Field Visits.

Who may attend : Engineers from State Electricity Boards, Power Utilities/ Corporations, R & D organizations, Academic institutions.

7.4.81 Electrical Protection System

Program Profile

- Requirement of protective system (criteria for selection & choice of protection scheme).
- Instrument transformers, system grounding, fault parameters, fault analysis, sequential recorder & disturbance recorders.
- Generator protection (This topic will be covered in derail with special reference to 210 MW & 500 MW generators).
- Transformers and Bus-bar protection schemes, Transmission line protection (principles of relaying and commissioning).

Who may attend : In-service Power Station Engineers having 2-3 years experience in the relevant field.

7.4.82 Relay Maintenance

Program Profile

- Basic protection requirements.
- Basic relay terminology.
- Different types of relays.
- Fault discrimination methods.
- Relay characteristics and setting, testing etc.

Who may attend : Technicians having 2-3 years experience in the relevant field.

7.4.83 Electrical Protection System - Numerical Relay

Program Profile

- Protection Systems- Basic Concepts, Fundamental Requirements, Types, Selection and Settings.
- Generator Protection.
- Transformer Protection.
- Bus Bar & LBB.
- Transmission Line Protection.

Who may attend : Engineers from State Electricity Boards, Power Utilities/ Corporations, R & D organizations, Academic institutions.

7.4.84 Protection Philosophy, Interlock and Relays Integration

Program Profile

- Protection Requirement and relays basics.
- Circuit Breakers.
- Various Types of Relays.
- Switchgear.
- Protection, Transmission line protection etc.
- Protection Interlocks and its procedure.
- Feedback Session.

Who may attend : Experienced and fresh Diploma and Graduate Engineers.

7.4.85 Operation & Maintenance (O&M) of Transformers and Circuit Breakers

Program Profile

- Transformers-Construction, connections.
- Tap Changing Mechanism & Parallel Operation.
- Selection and sizing of Transformer, Transformer Neutral Earthing and Substation.
- Earthing Practices.
- Testing of Transformers.
- Condition Monitoring of Transformers.
- Protection of Transformers.
- Maintenance of Transformers.
- Application and Design of Air and Gas Insulated Circuit Breakers
- Selection, Sizing, Performance Analysis of Circuit Breakers
- O & M of Circuit Breakers.
- Testing and Condition Monitoring of Circuit Breakers.
- Testing of Circuit Breakers.
- Field visits.

Who may attend : Engineers from state Electricity Boards, Power Utilities/ Corporations, R & D organizations, Academic institutions.

7.4.86 Operation & Maintenance (O&M) of Distribution System

Program Profile

Performance improvement of power distribution systems depends on various factors like voltage rating, area location, method of power distribution, loading, design and technology of various hardwares. It also depends on methods of monitoring, metering and maintenance technique used.

- Various issues & challenges in Distributions management systems.
- Types of poles, various hardwares & fittings.
- Methods of Monitoring.
- Metering.
- Maintenance of distribution line.
- Advanced Distribution Operations.
- Integration with R-APDRP systems.
- Advanced Metering Infrastructure (AMI).

- Better Co-Ordination between transmission and distribution (Grid Discipline).
- Types of faults & causes.
- Maintenance of distribution lines.
- Methods of reduction of AT & C losses.

Who may attend : Engineers, Technicians & personal working in Transmission & distribution utilities.

7.4.87 Operation & Maintenance of EHV Sub-station

Program Profile

- Introduction to sub-station.
- Types of layout etc.
- Soil testing and site selection.
- Equipment inspection & selection aspects.
- Civil foundation for main equipments, tower, ground work.
- Structure and tower erection and fabrication alignment.
- Earthing, cable trench, cable tray.
- Protection system & its equipment.
- Design and erection.
- Switchyard HV equipments erection.
- Switchyard, compressor, lightening arrestors.
- Different safety aspects, fire protection devices, erection and commissioning.

Who may attend : Engineers with 2-3 years experience in electrical operation and maintenance of Power Station and transmission & Distribution.

7.4.88 Transmission & Distribution Equipment Maintenance

Program Profile

- Transmission and distribution system familiarisation.
- Maintenance involved during erection and commissioning of T&D equipment.
- Transmission and distribution system and equipment maintenance procedure.
- Preventive and predictive maintenance program & schedule.

Who may attend : Maintenance technicians with 2-3 years experience in the field.

7.4.89 Distribution Transformers Failure - Trends in O&M

Program Profile

- Design and Manufacturing of Distribution Transformers,
- Erection, Testing and Commissioning of Distribution Transfomers.
- Transformer Oil characteristics.
- Filtration and Reclamation Techniques.
- Maintenance of Distribution Transformers.
- Field Visits

Who may attend : Engineers from State Electricity Boards power Utilities/ corporation. Industrial Manufacturer dealers in transformers.

7.4.90 Operation & Maintenance (O & M) of Transformer

Program Profile

- Standaristaion and Specification of Transformers used in the Power station.
- Commissioning of Transformers.
- Types and Causes of Transformer failure.
- Testing of Solid dielectric.
- Transformer Oil-Its analysis, sampling and testing procedure.
- Transformer Maintenance Practices.
- Dissolved gas Analysis Techniques.
- Case Studies.

Who may attend : This course is meant for operation and Maintenance Technicians with 2-3 years experience in relevant field.

7.4.91 Switchgear Maintenance

Program Profile

- Introduction to circuit breakers, Arc formation, Arc quenching etc. Constructional details of different types and makes of circuit breakers like air circuit breakers, minimum oil circuit breakers, air blast circuit breakers, vacuum circuit breakers, SF6 breakers etc.
- Selection Criteria for switchgear.
- Design & Construction Data.
- Erection/Commissioning.
- Check-list and precautions.
- Maintenance & Testing procedures & Equipments.
- Case studies.

Who may attend : This course is meant for maintenance technicians with 2-3 years experience in Switchgear maintenance.

7.4.92 Transformer Maintenance

Program Profile

- Standardization & specifications of transformers used in Power Station.
- Selection of transformer, erection/ commissioning.

- Testing & causes of Transformers failures.
- Testing of solid dielectric.
- Insulating oil, indentification, sampling and testing procedures.
- Transformers maintenance procedures.
- Dissolved gas analysis techniques.
- Case studies.
- Drying of Transformer.

Who may attend : This course is meant for maintenance technicians with 2-3 years experience in Transformer maintenance.

7.4.93 Best Practices in Operation & Maintenance (O&M) of Distribution Transformers Leading to Zero Breakdown

Program Profile

- State of the art of Transformers.
- Tests to check the adequacy of Transformers.
- Insulation co-ordination of Transformers.
- Earthing, Loading, Maintenance & protection of Transformers.
- Failure, Failure analysis & condition monitoring of Transformers.
- Condition Monitoring of Transformer Oil.
- Diagnostic Monitoring by DGA with case histories.
- RLA of Paper Insulation by Furan analysis.
- Field visits.

Who may attend: Engineers involved in the Operation, Maintenance and Testing of Transformer from state Electricity Boards, Power Utilities, R & D organizations, Academic Institutions, Transformer manufactures transformer Oil processors and servicing organizations etc.

7.4.94 Operation and Maintenance (O&M) of Sub-Station

Program Profile

- Introduction to Substation.
- Types of Substation, Layout etc.
- Selection of Equipments and inspection Procedures.
- Civil foundation for main equipments,tower, grounds work etc.
- Earthing, cable trench and cable tray.
- Switchyard Operating Procedures.
- Equipments in Switchyard & their functions.
- Methods of Monitoring /Thermo-scanning, etc.
- Types of faults in substation.
- Methods of Inspection. Testing & Monitoring of various Switchyard equipments & its schedule.
- Procedures of substation & line maintenance.
- General practices of EHV/HV/LV substation operation & maintenance.
- Overview of GIS Substation.
- Substation Automation.

Who may attend : Engineers, Technicians & personal working in Transmission & distribution utilities.

7.4.95 O&M, Testing of Power Transformers and HT Circuit Breakers

Program Profile

- Transformers - construction, connections.
- Tap changing mechanism & parallel operation.
- Selection & sizing of transformers, transformer neutral earthing & substation earthing practices.
- Testing of transformers.
- Condition monitoring of transformers.
- Protection of Transformers.
- Application & design of Air & Gas Insulated circuit breakers.
- Selection & sizing, performance analysis of circuit breakers.
- O&M testing, condition monitoring of circuit breakers.
- Fields Visits.

Who may attend : Industrial/other consumer of electricity, electrical inspectors/ assisting officers, utility representatives, manufacturers/dealers of electrical equipment/ power cables/ LT/HT switchgear.

7.4.96 Switchgear and Transformer Maintenance

Program Profile

- Introduction to circuit breakers, Arc formation, Arc quenching etc.
- Constructional details of different types and makes of circuit breakers like air circuit breakers, minimum oil circuit breakers, air blast circuit breakers, vacuum circuit breakers, SF6 breakers etc.
- Insulating oil, identification, sampling and testing procedures.
- Oil Testing details for Crackle Testing, Break down testing, Oil filtration.
- Reading of schemes, control and wiring diagrams.
- Transformer construction details.
- Transformer maintenance procedures.

Who may attend : This course is meant for maintenance technicians with 2-3 years experience in Switchgear and Transformer maintenance.

7.4.97 Power Quality, Harmonics Mitigation and Reactive Power Management

Program Profile

- Introduction to power quality.
- Power Quality – impacts, manifestations.
- Consequences of power quality.
- Power quality measurement.
- Harmonics – sources, measurements and mitigation.
- Filters – Active and passive filters, selection of filters.
- Statcoms, custom power devices, Static Var Compensators.
- Reactive Power Control Equipment.
- Performance of Reactive Power Equipment under different Operating Conditions.
- Comparative Study of AVRs, OLTCs, Power Capacitors, Shunt Reactors, SVCs, TCRs, Statcoms etc, in reactive power management.
- Automatic Power factor controllers.
- Harmonics – causes, measurement and mitigation.
- Thyristor based and voltage source converter based FACTS Controllers.
- Case Studies.
- Technical Visits.

Who may attend : Practicing Engineers/ supervisors of industry, Utilities and faculty of educational institutions involved in maintenance of power quality and mitigation of harmonics.

7.4.98 Power Quality Measurement

Program Profile

- Importance of Power Quality.
- Index parameter of power quality measurements.
- Gaps and technological development in Power Quality.
- Potential step and sustainable solution for Power Quality Measurement.
- Challenges and advancement in Power Quality measurement solutions.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.99 Emerging Technologies in Reducing AT&C Losses

Program Profile

- IE rules.
- Source of technical Losses and methods of reducing them.
- Application of new Technologies (HVDS&ABC) in distribution System.
- Source of commercial Losses.
- Setting and checking of actuators and methods of reducing them.
- Legal empowerment to control the menace of power theft.
- AT&C Losses.
- Role of consumer associationand franchises to control commercial losses.

Who may attend : Engineers from SEBs/ Power Utilities/ corporations with 2-3 years of experience.

7.4.100 Distribution Network Planning for UG Cable Systems

Program Profile

- Types of Networks & Preparations for UG cabling.
- Introduction to project Management, Planning& Management of Distribution Systems Current rating of cables.
- AB Cables Design & condition Monitoring UG Cable System.
- Conversion of OH Cables to ABC & UG.
- Planning & procurement of cables.
- Type of installation & corrective measure.
- Selection of route.
- Reconnaissance survey, Preliminary survey, Engineering, design considerations for OH_UG Lines/Towers & Associated substations.
- Cable laying – Methods for LV,MV and HV cables.
- Preparations of DPR, Project Monitoring & Control, Project execution-Issues and Challenges with Case studies.
- Field Visits to UG Substation.

Who may attend : Engineers with minimum 2-3 years experience in O&M Distribution Networks.

7.4.101 Power Cables and Jointing Techniques

Program Profile

- Design & construction of Power Cables.
- Testing of cables.
- Testing of cable accessories.
- Demo of Cable Jointing.
- Failure of cables and case studies.
- Condition monitoring of power cables.
- Field Visits.

Who may attend : Engineers from State Electricity Boards Power Utilities/ Corporations, R & D organizations, Academic institutions, Power consumers, consultants/ contractors etc.

7.4.102 Distribution Metering

Program Profile

- Energy meters: Types & Construction.
- Testing, setting and calibration.
- Failure analysis.
- IE Rules
- Theft/Tampering and Inspection of consumer premises.
- Distribution meter reading.
- Rationalization and computerization.
- Field visits

Who may attend : Engineers from state Electricity Boards/ Power utilities/ Distribution System, R & D organizations, Academic institutions, manufacturers, contractors, consultants etc.

7.4.103 Transmission Line Maintenance and Introduction to Live Line Maintenance Techniques

Program Profile

- Substation maintenance philosophy and guidelines.
- Work permits, line clear procedure, maintenance of log books, records etc.
- Maintenance schedules : Routine, prerventive, predictive, breakdown and emergency maintenance schedules.
- Transformer, switchgear and reactor maintenance.
- Transformer oil testing and dissolved gas analysis.
- Introduction Live line maintenance techniques.
- Type of tools used in live line maintenance.
- Live insulator testing methods & introduction to hotline washing (wet & dry).
- Case study.
- Audio visual shows on hot stick-methods and bare hand techniques.

Who may attend : Executives in the rank of Jr. Engineers and above working in transmission line maintenance.

7.4.104 Hand - On Training on Power System for Engineering (PSSE)

Program Profile

- Basic of Power System.
- Hand flow Studies.
- Conting analysis and Voltage Stability.
- Short Circuit Studies, dynamics.

Who may attend : Engineers

7.4.105 Operation and Maintenance (O&M), Testing of Power Transformers

Program Profile

- Standardization & Specifications of transformers used in Power station.
- Selection of transformer, protection & schemes of protection and testing.
- Types & causes of Transformer failures.
- Testing of solid dielectric.
- Testing of liquid dielectric, standards.
- Predictive maintenance of failures.
- Dissolved gas analysis techniques.
- Case studies on transformer breakdown.
- Drying of Transformers.

Who may attend : Engineers with 3-4 years experiencein the relevant field.

7.4.106 Online Internship Training Program on Power Transmission, Distribution & Generation

Program Profile

- Overview of Electricity and Power
- Global Power Scenario
- Indian Power Scenario
- Electricity supply and Economic Growth
- Power and Energy Resources
- Conventional and Renewable energy resources
- Overview of Different types of Conventional Energy resources
- Overview of different types of Renewable energy resources
- Energy generation from Coal, Hydro, Gas, Tidal etc.
- Energy generation from Solar, Biomass, Waste, Wind etc.
- Overview of different types of coal and Coal energy. World and Indian Scenario of Coal.
- Overview of Electricity Generating electrical equipments like Synchronous generator, wind generator etc.
- Electricity Transmission and distribution equipments like Power and Distribution Transformer, Switchgear, Current & Voltage Transformer, Isolators, Lighting Arrestor, PLCC etc.
- Overview of different types and make of circuit breakers like air circuit breakers, minimum oil circuit breaker, Air circuit breaker, vacuum circuit breaker and SF6 breaker etc.
- Overview of Transformer components and constructional details.
- Electricity Generation from Solar energy, various equipments used in solar energy Installations.

- Solar Energy generation analysis using PV sys Software.
- Overview of Micorgrid, Macrogrid and Hybrid Renewable energy system.
- Introduction of Control Loops in Electrical Power Generation.
- Measurement of various parameters in Electricalsystems like voltage, current, Power, Temperature,Vibration, Pressure etc. Using electronics measurement devices.
- Overview of Supervisory control and Data acquisition System.

Who may attend : College students Engineering (Pursuing) in Electrical, Mechanical, Instrumentation and Electronics Engineering**.**

7.4.107 Best Practices in Distribution Operation & Management

Program Profile

- Distribution Transformer: Types of Transformers and functions, Specification and Selection of DTs, Design and Performance Characteristics, Testing, Quality Control, Erection and Commissioning, Operation and Maintenance.
- Instrument Transformers: Design of CVTs (Capacitor Voltage Transformers), IVTs (Inductive Voltage Transformers), CTs, Insulation design, Quality concepts, Quality checks, Tests, Erection and Commissioning, Failure analysis.
- Insulators: Types of Insulators, Components, Testing's (Mechanical, Electrical, Thermal and Other tests), Insulator Selection, Handling Installations and Trouble Shootings.
- Surge Arresters: Concepts of Metal oxide Arresters, Polymer arresters, Zinc oxide arresters, Application of Surge arresters up to 420kV, Testing aspects, Arresters for transmission line protection, Pollution behavioral aspects of metal oxide arresters.
- Electrical Cables: Manufacturing process, Design of Conductors, Insulations, Armouring, Outer Sheeting, Quality, Cable laying and Installation, Electrical Stress, Generalized Installation.
- Capacitors: Reactive power control, Reactive power management, Definition and origin of low power factors, Types of power factors, Effect of harmonics. Installation of APFC panel, Testing and Quality control, VAR support and power factor correction.
- Switch Gears and Control-Gears.
- Energy Meter: Metering Applications and Key Features, Installation Audits Requirements Field Testing Requirement, Growing meters technology, Revenue Protection, Regulatory requirements, Remote meter readings, prepayment technology, Load managements.
- Latest trends in Distribution Equipment and International Practices.
- Field Visit - Sub-Station Visit.

Who may attend : Junior Engineer, Workmen, Technicians.

7.4.108 Best O&M practices of Switchgear and Transformers

Program Profile

- Introduction to circuit breakers, Arc formation, Arc quenching etc. Constructional details of different types and makes of circuit breakers like air circuit breakers, minimum oil circuit breakers, air blast circuit breakers, vacuum circuit breakers, SF6 breakers etc.
- Selection Criteria for switchgear.
- Design & Construction Data.
- Erection/Commissioning.
- Check-list and precautions.
- Maintenance & Testing procedures & Equipments.
- Case studies.
- Standardization & specifications of transformers used in Power Station.
- Selection of transformer, erection/ commissioning.
- Testing & causes of Transformers failures.
- Testing of solid dielectric.
- Insulating oil, indentification, sampling and testing procedures.
- Transformers maintenance procedures.
- Dissolved gas analysis techniques.
- Case studies.
- Drying of Transformer.

Who may attend : This course is meant for maintenance technicians with 2-3 years experience in Transformer and Switchgear maintenance.

IV. HOT LINE TRAINING

7.4.109 Awareness Programme For Executives in Hot Line Activities

Program Profile

- Introduction to Hot Line Tools, Activities & Maintenance.
- Live participation in maintenance operation on 66KV, 220 KV Commercial lines.
- Live insulator Testing methods.
- Video and Film shows on Hot Stick Method and Bare Hand Technique.
- Introduction to Hot Line Washing (Wet & Dry).
- Extension of LLMT activities to switchyard.

Who may attend : Executives in the rank of Junior Engineer

and above who are not trained in Hot line Activities.

7.4.110 Switchyard Maintenance Techniques using LLMT for Linemen/ Supervisors

Program Profile

- Electrical Safety & Safe Clearances.
- General practice of switchyard maintenance.
- Practice on climbing towers and switchyard structure, precaution at different working positions.
- Use of different hardware used in the maintenance works (Ropes, earthing equipment, load handing equipments, etc.).
- Hands on demo/training on live switchyard location using Hot Stick Method (HSM) and using Bare Hand Methods (BHM).
- Use of thermo vision Camera for detection of Hot Spots in Maintenance Works.
- Introduction to live line washing of insulators, video films on LLMT.

Who may attend : Foremen, Linemen, Asstt Linemen, Supervisors, Junior Engineers, asst. Engineers etc. actively involved in EHV Substation Maintenance activities having physical fitness. It is preferred that one of the nominee be from Executive cadre.

7.4.111 Familiarization Program on Cold Lines

Program Profile

- Electrical Safety, First Aid and Fire fighting.
- Safety precaution at different working positions.
- Tower climbing practices.
- Use of different hardware used in maintenance works (Ropes, earthing equipment, load handling equipment etc).
- General Practice of Maintenance work on Transmission Line.
- Introduction to Live Line Maintenance Techniques.

Who may attend : Supervisors in the rank of Junior Engineer and ITI qualified Technicians who had undergone their basic/Induction level course after recruitment.

7.4.112 Live Line Punctured Insulator Detection (PID) on EHV Lines

Program Profile

- Testing of Live Insulator string using software based Positron PID kit.
- Downloading of stored result from Memory of Kit to PC.
- Analysis of results (Graphical & Analytical Method).
- Preparing Test Report.

Who may attend : Supervisors in the rank of Jr. Engineers and ITI qualified technicians who had undergone their basic/induction level course after recruitment.

7.4.113 Live Line Insulator Washing Techniques on EHV Switchyard/Lines at Onside

Program Profile

- Types and effect of Pollution on performance, its prevention and solutions.
- Safety aspects in Line/Hot Line Washing.
- Hot Line Washing Equipment set up and it's operating procedures.
- Safety aspects in Hot Line Washing of line and substation insulators.
- Care and methods of Washing on sub station equipment line Circuit Breakers, Current Transformers and Potential Transformers etc.
- Practice of Hot Line Washing on Live Lines at Tension Point, Suspension Point Post Insulators etc.
- Introduction to Dry Washing and Hot Spray Systems.

Who may attend : It is preferred that only those who hadworked in the relevant field and associated with some of the EHV line mainten ance activities quite some time, say, 2 to 3 years, after completing their entry level (Induction level) training course on cold lines may only be sponsored so that many of the techniques need not have to be repeated. It is preferred that the participants of the course should have been exposed to some of the Live Line Maintenance jobs at least a couple of years before they are sponsored for this training this will enable the trainer to ease his efforts by simply recalling those techniques and cpmcemtrate more on the techniques relevant to actual line line situation that are needed. Supervisors in the rank of Junior Engineers and ITI qualified Technicians may be considered for this course.

V. CONTROL AND INSTRUMENTATION ENGINEERING

7.4.114 Power Plant Instrumentation

Program Profile

- General Description of Power Plant Instrumentation and control and their layout details.
- Working principles of Instruments.
- Temperature/Flow/Level and Pressure measurement.
- Control valves and actuators.
- Programmable Logic Controllers (PLC), their applications.
- Introduction to Distributed digital control system Hardware and Software configuration.

Who may attend : Engineers from SEBs/Power Utilities/ corporations with 2-3 years of experience.

7.4.115 Control & Instrumentation (C&I) in Power Station (For Operation Engineers)

Program Profile

- General description of Power Station Instrumentation and control and their layout details.
- Basic Principles and working principles of instruments.
- Temperature Measurement.
- Flow Measurement.
- Introduction to On-Line Analytical Instrument.
- Introduction to Turbovisory Instruments & Vibration Analysis.
- Discussion on Protection & Interlocks.
- Introduction to Automatic Control Loops.

Who may attend : Engineers with 2-3 years experience in the relevant field.

7.4.116 Control & Instrumentation in Power Station

Program Profile

- General description of Power Station Instrumentation and control and their layout details.
- Basic Principles and working principles of instruments.
- Temperature Measurement.
- Flow Measurement.
- Introduction to On-Line Analytical Instrument.
- Introduction to Turbovisory Instruments & Vibration Analysis.
- Discussion on Protection & Interlocks.
- Introduction to Automatic Control Loops.

Who may attend : Engineers with 2-3 years experience in the relevant field.

7.4.117 Data Acquisition & Distributed Digital Control System in Thermal Power Station

Program Profile

- Introduction to Data Acquisition system Hardware & Software configuration.
- Introduction to Distributed Digital Control.
- Hardware & Software Configuration.
- Advantages of Distributed Control System.
- Configuration of single loop and multi loop Controller.

Who may attend : Engineers working in Power station with 3-7 years experience.

7.4.118 Power Plant Auto Control

Program Profile

- Auto Control Action Theory (PID) and their relevance to process reaction rate and dead time.
- Auto loops in Power Station with their built up action Hardware and Software.
- Selection and application of final control elements such as control valves, dampers, etc.
- Feed forward and feed back signal selections.
- Actuators: electric, Pneumatic and Hydraulic; their relative merits and applications.
- Thyristor drives and thyristor controlled drives.
- Limit switches and Torque switches
- Coordinated control concept and applications.
- Microprocessor based programmable logic controllers (PLC's) Distributed Digital Control System concepts.
- Periodical tuning Techniques and tuning requirements.
- Commissioning of Automatic control loops with individual action, tuning techniques on Automatic Control Simulators.

Who may attend : Engineers with 2-3 years experience in the relevant field.

7.4.119 Power System Communication SCADA & EMS

Program Profile

- Data Acquisition System.
- Supervisory Control.
- Communication: VSAT, Microwave, Optical Fibre.
- Communication networks & protocols.
- SCADA in Transmission and Distribution.
- EMS Hardware: Control Centre.
- EMS Software: SCADA & Database.
- EMS Software: Generation applications.
- EMS Software: Networking applications.
- Field Visits

Who may attend : Engineers from State Electricity Boards, Power Utilities/ Corporations, R & D organizations and Academic institutions.

7.4.120 Intelligent Load Management System

Program Profile

- Intelligent Load Management System, SCADA.
- Use of SCADA in GRID Operation.
- Visit To SCADA Control Room.

Who may attend : Experienced Diploma and Graduate Engineers DISCOMS & GENCOS.

7.4.121 Vibration Diagnostics and Fault Analysis

Program Profile

- Principles of Vibration.
- Basic motion, period, frequency, natural frequency, reasons, critical speeds.
- Data Acquisition Instrumentation, Transducer operation – selection, Signal processing, FFT application.
- Fault AnalysisSpectrum analysis, mass unbalance, misalignment, mechanical looseness, bearing defects, central fault recognition.
- InstrumentationTransducer operation, Transducer selection.
- Sensor mounting issues, Mounted Natural Frequency.
- Signal processing, FFT application.
- Linear versus logarithmic**,** Trending.
- Workshop.

Who may attend : Engineer and supervisors with at least 2 years experiences in O & M of Power Station and other industries.

7.4.122 PLC & SCADA in Thermal Power Plant

Program Profile

- Introduction to PLC.
- Application of PLC in Thermal Power Plant.
- Data Acquisition System.
- Supervisory System – Communication System-Wire Wireless.
- Communication Networks & Protocol SCADA in Thermal Plant.

Who may attend : Engineers.

7.4.123 Burner Management System/FSSS

Program Profile

- Flame sensors; their types, selection, application and installation techniques.
- Flame scanning intelligence.
- logics and logic circuit built around solid stat relay devices for working out permissive.
- Fuel sequencing, fuel cut off and boiler trip protections.
- Logics and logic circuits for sequential start up and shut off procedures.

Who may attend : Fresh Engineers engaged in Control and Instrumentation.

VI. DISASTER AND SAFETY MANAGEMENT

7.4.124 Fire Prevention, Protection & Safety

Program Profile

- Different types of fire hazards in Power Plant and Industry.
- Plant design & layout with respect to fire hazards and prevention.
- Classification of fire and various methods to combat fire.
- Fire fighting arrangement in different areas of Power Plant and Industry.
- Safety connected with fire hazards in Electrical Installations.
- Application of different safety rules in Industry.
- Management of fire fighting & First Aids.

Who may attend : Engineers and Senior Supervisor of Thermal Power Station and process industries.

7.4.125 Disaster Management, Electrical Safety Procedures and Accident Prevention

Program Profile

- Disaster and Impacts Warning Systems and Response Management and Mitigation.
- Impact of different types of disasters, Trigger mechanisms and wiring systems.
- Check lists and preparedness to address disasters.
- Development of an On-Site and Off-site Disaster management Plan.
- Development of Mock Drill Format's Institutional set up for disaster.
- Electrical safety procedures and Manuals.
- Indian Electricity Rules, The Safety systems & Procedures, Accident prevention methods, Safety codes.
- Accident prevention techniques and Accident Reporting procedures.
- Recording and Reporting systems, Review and methods to avoid recurrence.
- Accident analysis, Technical prone to accident analysis.
- Ergonomics, Reports filling details.
- Investigation reports, Steps to avoid recurrence.
- Standard earthing practices.
- Standard earthing practice, Materials towards earthing, Earthing at substation, lines, service centers, etc.
- Power Grid Collapses.
- Role of distribution utility, Causes and remedies, Black start procedures, Restoration procedures, Islanding systems, equipment, and procedures.
- Firefighting Techniques-Electrical and Oil fires.

- Firefighting norms for sub stations, Firefighting equipment's and systems, Care and operations for combating fire.
- First aid practices for different emergencies.
- First aid victims under different cases – fractures, burns, electrical shock, unconsciousness, snake bite, fall from height, cuts and wounds, Artificial respiration systems, Treatment for electrical shocks, Mechanical accidents.
- Case Studies based on the above topics.
- Incorporation exercise based on the above topics.

Who may attend : Managing Director, CEOs, Superintending Engineer, Chief Engineer, Executive Engineer, Assistant Engineer and their Equivalent.

7.4.126 Electrical Safety and Inspection of Electrical Installations, Accident, Prevention Recent Trends

Program Profile

- Overview & Safety Requirements of IE Rules.
- Design of Electrical installations.
- Earthing System Design.
- Circuit Breakers and Protective Relays.
- Basic Protection Schemes of Power Equipments.
- Inspection procedures for statutory inspection by Electrical inspectors.
- Check Point of Electrical inspection
- Pre-commissioning tests of Transformers, Switchgears and Power Cables.
- First Aid and Fire Fighting Practices in Industrial Installations/Substations.
- Field Visit.

Who may attend : Industrial / other consumers of electricity, electrical inspectors/ assisting officers, utility representatives, manufacturers / dealers of electrical equipment / power cables / LT / HT switchgear.

3.4.127 Safety in Hydro Power Station

Program Profile

- General safety precaution, treatment of electrical or acid/alkali burns, permit to work, first aid, protective gear/clothing, safety in movement and storage of materials, safety aspects of switchyard. Fire safety procedure. Fire protection of generator. Firefighting and emulsifier type protection.

Who may attend : Engineers/Shift Engineers/Operators working in Hydro Power Plant.

7.4.128 Operational Safety

Program Profile

- Permit to work Practice/procedure.
- Fire Fighting basics and process.
- Fire extinguisher types and selection.
- Fire Fighting Demonstration.
- Precautions and process while handling equipments and Safety Equipments.

Who may attend : Operators, ITI Holders, Diploma & Engineers (Fresher & Experienced).

7.4.129 Electrical & Fire safety for Distribution Utilities

Program Profile

- Clearances & compliances of CEA (Measures relating to safety & electrical Supply) Regulations.
- Safety & system Earthing.
- Methods of earthing.
- Safety aspects in Service connection & Installation.
- Tools & Plants for Maintenance.
- Operation & Maintenance procedures for Distribution System.
- Breakdown Operations in distribution systems.
- HT- LT Metering & Testing.
- Safety aspects in Street Lighting.
- Fire fighting techniques for Electrical and oil fires in sub stations and First Aid practices for different emergencies.

Who may attend : Engineers, Technicians & personal working in Transmission & distribution utilities.

7.4.130 "Measures Relating to Safety and Electrical Supply"

Program Profile

- Clearances and Compliances of CEA (Measures relating to safety and electrical supply Regulation 2010: Minimum clearance between phase to phase and phase to ground for different Voltages, CEA (Measures relating to safety and electrical supply Regulation 2010 pertaining to Sub-stations.
- **HV Sub-station:** main equipments used including Gas Insulated Switching system and their safety norms.
- Detailing of High Voltage Lines, Types of Towers, types of insulators and their electrical and mechanical characteristics and safety aspects.
- Introduction to Indian Standard Specification for Electrical wiring, Energy Conservation Switch Yard Operation and Maintenance-Circuit Breakers and Isolators and Bus bars: their types, operating mechanism, maintenance procedures and case studies. Current Transformers, Potential Transformers and Lightning Arrestors.
- **Control Room:** Necessity and function of boards, types of boards, types of relays and indicators,

mimic diagram. Function of various relays, their settings. Remote control of breakers, isolators, tap changers. All in respect of safety.

- **Earthing:** Safely earthing and system earthing, methods of earthing. Peterson coil earthing, earthing of Lightning arrestors- importance and advantage. Earth electrodes, earth mats, values and measurement of earth resistance.
- Capacitors and their functions, Types, ratings and case studies of failure. Safety requirements.
- **Transformers:** Function and Maintenance aspects. Safety opted in O&M.

Who may attend : Engineers, Technicians & personal working in Power Sector, Transmission & distribution utilities.

7.4.131 Industrial Safety

Program Profile

- To Familiarize about industrial safety requirement
- Classification of Industrial safety and level of safety in various industries
- Classification of fire and various methods to combat fire.
- Fire fighting arrangement in different areas of Power Plant and Industry.
- Safety connected with Industrial and fire hazards in Industry and mitigation.
- Application of different safety rules in Industry.
- Fire extinguisher types and selection.
- Fire Fighting Demonstration

Who may attend : Engineers, Technicians & personal working in Power Sector, Transmission & distribution utilities.

7.4.132 Industrial Plant Safety

Program Profile

- Industrial safety norms/ guidelines.
- Walking and working surfaces and PP equipment
- Material handing safety at Plant site
- Electrical safety based on American safety standard
- Machine guarding. Firefighting and first aid
- Industrial operational safety and emergency action plan.

Who may attend : Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.133 Electrical Safety in Power Utilities On-line Workshop

Program Profile

- To familiarize about the electrical safety standard in Power Utilities and different procedures for safe electrical operation.
- Overview & Safety Requirements of IE Rules.
- Safe operation of Electrical installations.
- Checking of Earthing System
- Electrical Safety procedures for Circuit Breakers and Protective Relays.
- Inspection procedures for statutory inspection by Electrical inspectors.
- Electrical Safety Check Point of Electrical inspection of Electrical installations.
- Electrical Safety Check Point of Transformers, Switchgears and Power Cables.
- First Aid and Fire Fighting Practices in Industrial Installations/Substations

Who may attend : Engineers, Technicians & personal working in Power Sector, Transmission & distribution utilities.

VII. GRID INTEGRATION, SMART GRID & SMART CITIES, EV AND ENERGY STORAGE SYSTEM

7.4.134 Renewable Energy Generation & Integration with Grids

Program Profile

- Overview of Power Scenario and Importance of Renewable Energy.
- Solar Energy.
- Wind Energy.
- Bio-Mass Energy.
- Renewable Energy Purchase Obligations.
- Tarriff Regulations related to Renewable Energy.
- Renewable Energy Power Evacuation Issues.
- Net Metering and grid Connectivity for Renewables.
- Role of Smart Grid in Integration of Renewable Energy and DSM.
- Renewable Energy Certificates.
- Grid Operation and balancing of Renewable Energy Power.
- Inter Connection Standards of Distributed Generation.
- Field Visits.

Who may attend : Engineers from State Electricity Boards/ Power Utilities/ Distribution Systems, R&D organizations, involved in implementation of renewable source and their integration.

7.4.135 SPV Power Plant - Integration with Grid and Storage Batteries

Program Profile

- Overview of renewable energy in India-Feasibility studies.
- Introduction to PV Technology Basic of Solar cell & PV modules- Engineering process Technology.
- Solar charge controller –types Basic of Solar Inverter.
- Introduction to SPV Design; types of SPV system & their components.
- Basic understanding of SPV System Integration.
- On Grid/Hybird/Grid-interactive SPV System.
- SPV Project implementation, basic criteria requirements, standards & Procedures.
- Manufacturing Technology of Solar PV Modules.
- Field Visits.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Researchers, Entrepreneurs.

7.4.136 Smart Grids and Renewable Energy Integration

Program Profile

- Importance of emerging role of Smart Grids for future Power Systems.
- Differences between Traditional Grids and Smart Grids.
- Grid Integration and Renewable energy storage, integration and prediction.
- Grid integration challenges and prospective solutions.
- The role of Smart Grid in Integrating Renewable Energy.
- Comprehensive overview of Smart Grid Pilot Projects

Who may attend : Engineers/ Managers/Researchers from power industry including R&D Labs, Student or Faculty interested in the area of RE integration in Smart grids.

7.4.137 Role of Smart Grids on the Indian Power Sector: Current Developments, Challenges and way Forward

Program Profile

- India's energy realities and emerging needs.
- Smart Grids - Concept and application areas.
- Global Developments.
- Developments in India.
- One model of Mini Grid.
- Integration of Mini Grid to Smart Grid.
- How to make Mini Grid to Smart Grid.
- Challenges to Accelerated Deployment.
- Case Study.
- Way Forward.

Who may attend : Engineers working in Transmission& Distribution sector.

7.4.138 Development of Microgrid (MG) and Macrogrid (MCG) in India

Program Profile

- Concept note and detailing of Microgrid and Macrogrid in India.
- Architecture and modeling of Microgrid and Macrogrid.
- Uncertainty and modeling challenges in MG, MCG.
- Optimal solution and recent development of MG, MCG.
- Challenges in implementation of MG and MCG.
- MG, MCG development for Rural India and Potential.

Who may attend : Professionals from Power Sector, Engineers, Academicians, Equipment manufacturers, Researchers, Engineering, Managers.

7.4.139 Smart Grid and Smart Metering Technologies and Applications

Program Profile

- Smart Grid Goals, History, Scale and Scope.
- Functions and Features of Smart Grid, Demand Response Support.
- Net metering and Grid Connectivity of Renewable Sources.
- National and International Specification on Smart Meters and energy meters.
- Smart Meters - Issue and Concerns.
- Standardization of Smart Metering.
- Inter Operability Testing Methods and Specials Purpose Energy Metering.
- Technology challenges and way forward.
- Demonstration at PSTI.
- Role of Smart Meters in Arresting Theft/Tampering.
- Field Visits.

Who may attend : Engineers from State Electricity Boards/ Power utilities / Distribution Systems, R & D organisations, Academic institutions, manufacturers, contractors, consultants etc.

7.4.140 Smart Grid for Utility Engineers

Program Profile

- Smart Grid Basics/ Overview and Evaluation of Micro Grid.
- Developing a Smart Grid Roadmap in India.

- On-going Smart Grid Activities in India.
- Smart Grid for Distribution Network and Initiates.
- RE based Distributed Generation and Smart Grid of the future.
- Grid Integration of Solar in to Power System.

Who may attend : Engineers involved in the operation and control of Distribution system and Academician with 2-3 years experience in the relevant field.

7.4.141 Smart Power Flow Controller for Smarter Grid Applications

Program Profile

- Principles of active and reactive power compensation.
- Traditional power flow controllers – voltage regulating transformer, phase angle regulator, shunt inductor/ capacitor, and series inductor/capacitor.
- Voltage-sourced converter (VSC) – 2 and 3 level poles.
- 6, 12, 24 and 48-pulse harmonic neutralized VSCs.
- PWM VSC, VSC-based technology and its implementation, comparison of simulation and field results; Sen Transformer.

Who may attend : Junior and Middle Level Managers/ Executives from DISCOMs/TRANSCOs/ Regulators/ Consultants/ Faculty/ Researchers/P.G Students.

7.4.142 Smart Grids for Smart Cities

Program Profile

- Concept and Salient features of smart grid as per GOI initiatives.
- Infrastructure upgrade of sub transmission and distribution networks.
- Smart city's energy requirements coming from solar, renewable energy utilization.
- And de-centralized distribution generation for smart cities.
- Smart efficient street lighting.
- Outage management system.

Who may attend : Engineers from State Electricity Boards/ Power utilities/ Distribution System, R&D organizations, Academic institutions, manufactures, contractors, consultants etc.

7.4.143 Battery Maintenance

Program Profile

- Introduction and constructional details of batteries.
- D.C. supply system.
- Charging and discharging of batteries.
- Preparation of electrolytes.
- Battery plate assembly and dismantling practices.
- Care & maintenance of batteries.

Who may attend : Technicians working in Power Stations with 2-3 years experience.

7.4.144 E-Mobility Mission of India: Concepts & Implications

Program Profile

- Hybrid and Electric Vehicles for India (E-Mobility - Road, Rail, Metro & Drones).
- International Standards for EVs and their impact on EV deployment, R&D and manufacturing in India. (Future Trends and Market in EV deployment).
- EV System architecture concepts.
- EV Motor drives and controllers.
- Storage Systems & New Battery Technologies, Potential and Forecasts.
- EV Charging Systems. (Smart Grid, Charging Infrastructure and V2G).
- Power grid and renewable energy resources interfacing for EV Development. (ICT services for EV ecosystem).

Who may attend : Indian and global EV manufacturing industry in the automotive hub of India automotive industry leaders, Govt. leaders, policy makers, business people, innovators, technicians, consultants, and research and development professionals,all looking for greater efficiency, safety, and low carbon vehicle.

7.4.145 E-Mobility & Charging Infrastructure

Program Profile

- EVs: A clean mobility option.
- Motion and dynamic equations for vehicles.
- Propulsion requirements for vehicles.
- HEV architectures.
- EV architectures.
- Mechanical systems used in EVs and HEVs.
- Fundamentals of Regenerative Braking.
- Electrical machines for EVs and HEVs.
- DC-DC Converters.
- Boost and Buck-Boost Converters.
- Multi Quadrant DC-DC Converters.
- Voltage Control of DC-AC Inverters Using PWM.
- Control Systems for the HEV and EVs.
- The fuzzy logic based control system.
- Batteries for EVs.
- Fuel cell and supercapacitors.
- Electric vehicle charger.
- Electric vehicle charger technology.
- The EV charging station architecture.
- EV chargers and portfolio management.

- EV charging and the grid.
- Smart grid and EVs.

Who may attend : Engineering students and Working Professionals

7.4.146 E-Mobility: Concept & Implication

Program Profile

- Hybrid and Electric Vehicles for India (E-Mobility - Road, Rail, Metro & Drones).
- International Standards for EVs and their impact on EV deployment, R&D and manufacturing in India. (Future Trends and Market in EV deployment).
- EV System architecture concepts.
- EV Motor drives and controllers.
- Storage Systems & New Battery Technologies, Potential and Forecasts.
- EV Charging Systems. (Smart Grid, Charging Infrastructure and V2G).
- Power grid and renewable energy resources interfacing for EV Development. (ICT services for EV ecosystem).

Who may attend: Indian and global EV manufacturing industry in the automotive hub of India automotive industry leaders, Govt. leaders, policy makers, business people, innovators, technicians, consultants, and research and development professionals,all looking for greater efficiency, safety and low carbon vehicle.

7.4.147 Battery Energy Storage & Microgrids in India

Program Profile

- Energy Storage System Status in Global & Indian Market.
- Current Energy Storage Systems.
- Types and features of energy storage systems. (Classification of EES systems, Mechanical storage systems, electrochemical storage systems, Chemical energy storage, Electrical storage systems & Thermal storage systems).
- Standards & Technical Comparisons.
- Standards for EES.
- Technical comparison of EES technologies and On-grid solutions & off-grid solutions.
- Peak Load Management & DSM.
- Benefits of storage and managing peak load.
- Markets for EES.
- Present status of applications.
- Utility use. (Conventional power generation, grid operation & service).
- New trends in applications. (Smart Grid, Smart Microgrid, Smart House, Electric vehicles).
- Lead acid batteries.
- Basics operating technology and battery performance requirement for different applications.
- Different designs of lead acid to meet the performance requirements.
- Materials & methods of manufacture of lead acid batteries.
- Effect of material used Vs different performance requirements.
- T Q A of Lead acid batteries.
- Understand various manufacturing processes, advantages and shortcomings of these processes.
- Basic process of quality assurance.
- Key quality control & test points for acceptance or rejection.
- Symptoms for trouble and corrective measures.
- Lithium ion batteries.
- Basic chemistry and their comparison related to performance, applications & cost.
- Manufacturing advances, Battery components, Equipment & Recycling.
- Energy Storage system Design considerations for grid applications.
- T Q A of Lithium ion batteries.
- Safety, Standards, Testing and Certification related to ESS.
- Key quality control & test points for acceptance and rejection.
- Case studies of Energy storage projects in global scenario. This two-day workshop will provide participants with knowledge of Microgrids, its architecture, Battery energy storage systems of both lead acid type and Lithium ion type its testing & quality analysis.

Who may attend: Officers of the power sector organizations, GENCO's, DISCOMs, Regulatory commissions, TRANSCOs and all power sector stakeholders.

7.4.148 Renewable Energy and Grid Interface Technologies and Regulatory Framework.

Program Profile

- Solar Energy.
- Wind Energy.
- Bio-Mass Energy.
- Renewable Energy Purchase Obligations.
- Tarriff Regulations related to Renewable Energy.
- Renewable Energy Power Evacuation Issues.
- Net Metering and grid Connectivity for Renewables.
- Role of Smart Grid in Integration of Renewable Energy and DSM.
- Renewable Energy Certificates.

- Grid Operation and balancing of Renewable Energy Power.
- Interconnection Standards of Distributed Generation.
- Point of connection and feed-in-tariff
- IEGC Grid Code standard for Solar and wind Farms.

Who may attend: Officers of the power sector organizations, GENCO's, DISCOMs, Regulatory commissions, TRANSCOs and all power sector stakeholders.

7.4.149 Grid Integration of Hybrid Generation: Review of existing Sub-Station Controls required for upcoming RE Mix in Switchyard and handling Intermittency with Grid and Energy Storage options

Program Profile

- Hybrid Generation Fundamentals and Challenges, Concepts of Grid Interface Technologies.
- Review of existing substation for Interconnection with upcoming RE Generation: Analytical Approach.
- Energy Balancing Mechanism and Scheduling of RE System with Adequate Controls for RE Interconnection in existing Switchyard.
- Hybrid Generation Era Grid Codes: Technical Standards and handling of Intermittency in Integrated Large Grid.
- Evolving Energy Storage Technologies (Pumped Storage, Battery Storage Technologies, Thermal Storage and Flywheels).
- Renewable Energy Regulation in Energy Market : Technology Options for Effective Open Access.

Who may attend : Engineers/Shift Engineers/Operators working in Hydro Power Plant.

7.4.150 Smart Transmission & Distribution System

Program Profile

It consist of various parameters of smart grid implementation such as economy, design technology options, reliability, qulity & pay-back period. It includes various policies for advanced metering infrastructure (AMI) and AMI projects in India.

- Requirements for AMI infrastructures.
- Working of Advanced Metering Infrastructure (AMI).
- Metering Demand.
- Meter Data Management Systems (MDMS).
- Virtual and Aggregated Net Metering.
- Response (DR), including Virtual Power Plants (VPPs).
- Monitoring (WAMS) using PMU/PDCs.

Who may attend : Engineers, Technicians & working professionals in Transmission & distribution utilities.

VIII. IT, ICT, GIS & RS, BIG DATA ANALYTICS AND CYBER SECURITY

7.4.151 IT General for Utility Engineers

Program Profile

- Introduction to Computer, Internet, networking, Email, Hardware Etc.
- Elements of Word, Excel, PowerPoint or similar packages.
- Customer Care Services.
- Management Information System.
- E-Governance including advantages/Applicability of IT to present distribution system including Success Stories / Case Studies, Security / Access Rights.
- Data Center Operation and Maintenance.

Who may attend : Chairman/MD, Director, Chief Engineer, Chief Accounts Officer, Superintendent Engineer, Executive Engineer, Assistant Engineer, Deputy/Accounts Officer (or) any other equivalent rank mentioned above.

7.4.152 Cyber Security in Power Sector

Program Profile

- Evolution of cyber threats.
- Cyber security key challenges covering: Appreciation of threat itself, Challenges in the discovery of the threat, identifying the perpetrator or the source of the threat, determining the appropriate response, Lack of international legal framework.
- Cyber security objectives: Confidentiality, Integrity, Availability.
- Cyber security requirements : Identification, Authentication, Authorization, Trust, Access Control, Privacy.
- Components of cybersecurity strategy: Prevention, Detection, Response, Recovery.
- Five step methodology: Selection of use cases with cyber security considerations, Risk assessment methodology, Development of security architecture, High level security requirements, Assessment of smart grid standards.
- Privacy and smart grid.
- Research and development themes: Device level, Cryptography and key management, Systems level, networking issues.

Who may attend : Power Sector Professionals involved in Information security of the Power Sector, researchers, professionals from academic and R&D Institutions.

7.4.153 Smart Grid Technologies, Internet of Things and Cyber Security

Program Profile

- Conventional Electrical Grid, its Operation and Control.
- Smart Grid System, its architecture and Advantage.
- IoT aided Renewable Energy System – Solar & Wind – Smat
- Electric Vehicle – Smart Cities etc.
- Cyber Security Issues in loT Based Smart Grid Systems & Solutions – Challenges.

Who may attend : Engineers Professionals.

7.4.154 Block Chain Technology.

Program Profile

- Introduction to Block Chain
- Smart Contacts and ledgers, Ethereum frame work
- Crypto Currency – Concepts & Applications
- Application of Block Chain Technology to power Industry

Who may attend : Engineers from Utilities/Faculties/ Research Scholars/PG & UG Students

7.4.155 Internet of Things for Smart Grid Applications.

Program Profile

- Conventional Electrical Grid , its operation & control
- Smart Grid System, its Architecture and advantage
- IoT aided Renewable Energy System – Solar –Wind-Electric Vehicles – Smart Cities
- Issues & Challenges in IoT based Smart Grid Systems

Who shall attend: Engineers/IT Professionals from Utilities/Faculties/Research Scholars/PG & UG Students

7.4.156 GIS and Remote Sensing Application in Hydropower Project

Program Profile

- Principles of remote sensing and Image processing. Creation of data base in GIS
- Open Data sources
- RS and GIS applications in estimation of inflow for projects
- Design flood estimation for hydropower projects
- Geospatial and hydrological modelling to assess hydropower potential zones and site location
- GIS in small hydroplaning resource management
- Geospatial information support for Power Projects
- Sediment yield modelling and reservoir sedimentation using GIS
- Impact of climate change on hydropower

Who may attend : Degree/Diploma Engineering Electrical, Electrical & Electronics, Power Engg. Mechanical, Civil Instrumentation and Electronics, Professionals in Utilities

7.4.157 Internet of Things For Robotics: On - Line Webinar

Program Profile

- Introduction to Embedded and IoT
- Arduino Programming & Proteaus Emulator
- Arduino Simulation & Serial Communication & Hands on Practice using Emulator
- Introduction to Raspberrypi - Inverse Kinematics Logic
- Different Type of Actuators 9 Dc Motor, Servo Motor & Stepper Motor)

Who may attend : Engineers/IT Professionals from Utilities/Faculties/Research Scholars/PG & UG Students

7.4.158 Data Science & Big Data Analysis with Industrial Orientation (Energy & Utility)

Program Profile

Energy Utilities has been helping Power sector to analyze their historical data. Data Analysis gave the utilities to predict events and suggest actions. What to do with that information, and how to mine it for trends, insights and predictors of future behaviour, has increasingly become a key driver for a successful Power business. Past few years have witnessed a phenomenal growth in the reach of data Sciences. Big Data Analytics is basically looking for domain of analytics is to skills and perspective actions. Energy and Power Utilities are looking for Data Scientists, Data Engineers, Big Data Analysts, Data Strategist, Data Architect, Data Visualization Analyst, Data Quality Manager etc.

- Over view of data science
- Composition and types of data
- Data matrix and data mining
- Data mining and clustering of data
- Big Data Quality and data visualization

Who may attend : Engineering Professionals

7.4.159 Cyber Security Issues in Smart Grid System – Online Webinar

Program Profile

- Evolution of cyber threats in Smart Grid.
- Cyber security key challenges in Smart Grid
- Cyber security objectives: Confidentiality, Integrity,

Availability.

- Challenges in the discovery of the threat, identifying the perpetrator or the source of the threat, determining the appropriate response, Lack of international legal framework.
- Cyber security requirements: Identification, Authentication, Authorization, Trust, Access Control, Privacy for Smart Grid
- Components of cyber security strategy: Prevention, Detection, Response, Recovery.
- Cyber security considerations for Smart Grid, Risk assessment methodology, Development of security architecture, High level security requirements, Assessment of smart grid standards. Research and development themes. Cryptography and key management, Systems level, networking issues.

Who may attend : Engineers from State Electricity Boards/ Power utilities/ Distribution System, R&D organizations, Academic institutions, manufactures, contractors, consultants etc.

7.4.160 Internet of Things for Smart Grid – Online - Workshop

Program Profile

- Conventional Electrical Grid, its Operation and Control.
- Smart Grid System, its architecture and Advantage.
- Internet of Things aided Renewable Energy System – Solar & Wind – Smart
- Internet of Things aided Smart Grid System
- Electric Vehicle – Smart Cities etc
- Cyber Security Issues in Internet of Things Based Smart Grid Systems, Solutions and Challenges.

Who may attend : Engineers from State Electricity Boards/ Power utilities/ Distribution System, R&D organizations, Academic institutions, manufactures, contractors, consultants etc.

7.4.161 Data Sciences & Big Data Analytics

Program Profile

- Current Challenges for Utililties.
- Big Data for Utilities transformation.
- Descriptive, Prescriptive & Predictive analytics.
- Case Studies with industrial Orientation (Energy & Utility).

Who may attend : Engineers/Faculties/ Research Scholars/ PG students.

IX. ENERGY EFFICIENCY, ENERGY AUDIT AND DEMAND SIDE MANAGEMENT

7.4.162 Energy Efficiency Management in Power System

Program Profile

- Salient features of power generation, transmission and distribution system equipments and their functioning and monitoring.
- Measurement of performance parameters and energy efficiency calculations.
- Energy efficient technologies.
- Demand side management.
- Investment decisions for enhancement of energy efficiency.

Who may attend : Engineers working in the area generation, transmission and distribution.

7.4.163 Energy Audit and Loss Reduction in T&D Systems

Program Profile

- General Introduction – Electrical System.
- Electric motor.
- Compresses Air System.
- HVAC& Refrigeration System.
- Power quality, Harmonics,manifestation measurement, migration.
- Fans & Blowers.
- Pumps & umping System.
- Cooling tower, Lighting System, Diesel Generating System.
- Energy efficient technologies in Electrical Systems.
- Compressed Air Systems.
- Tutorials, Case studies, Labs and Technical visits- This complies with the syllabus of BEE's Energy Manger - Paper-3.

Who may attend : Engineers from State Electricity Boards/ Power Utilities/corporation, PSU, R&D organizations, Academic Institutions, entrepreneurs & consultations, contractors involved in energy Audit & energy Audit & energy conservation project.

7.4.164 Energy Efficiency in Electrical Utilities

Program Profile

- General Introduction- Electrical systems.
- Power quality.
- Harmonics- manifestation measurement.
- Mitigation.
- Electric Motor.
- Compressed Air System.

- HVAC & Regrigeration System.
- Fans & Blowers.
- Pumps & Pumping System.
- Cooling Tower.
- Lighting System.
- Diesel Generating System.
- Energy Efficient Technologies in Electrical Systems.
- Tutorials
- Case studies.
- Labs and Technical Visits-this complies with the syllabus of BEE's Energy manger - Paper - 3.

Who may attend : Engineers form State Electricity Boards, Power Utilities/ Corporations,PSUs,R&D organizations, Academic institutions, entrepreneurs and consultants/ contractors involved in energy audit and energy conservation projects.

7.4.165 Energy Conservation and Energy Audit (For Generation Sector)

Program Profile

- Potential areas in the Power Industries for energy saving.
- Energy Saving methods with typical examples and exercises for power stations.
- Ways to minimise losses in power transmission & distribution system.
- Better use of electrical energy.
- Proper storage and use of fuel.
- Waste Heat areas and their utilization.
- Co-generation techniques for energy boosting.
- Energy Management System, energy Auditing and their implementation techniques for power industries.

Who may attend : Engineers with 3-4 years experience in Thermal Power Stations.

7.4.166 Energy Audit & Demand Side Management in Power Utilities

Program Profile

- Energy Scenario in the country and scope of energy conservation.
- Energy Losses: An Integrated optimal strategy for reduction of T&D Losses.
- Demand forecasting techniques.
- EMS & LMS and Role of Energy Managers.
- DSM Techniques.
- DSM Methodologies.
- DSM through Loss Reduction in Primary and Secondary Distribution System.
- Need for Energy Audit and Audit Procedures.
- Energy Audit – Macro Level & Micro Level.
- HT - Metering & Metering Technique.

Who may attend : Engineers with 3-4 years experience in Thermal Power Station.

7.4.167 Big Data Analytics & Data Science Training covering descriptive, prescriptive & predictive analytics hands on case studies with Industrial orientation (Energy & Utility)

Program Profile

Today's technologically - driven society, terabytes of data is being generated every day. Businesses have information about their customers, suppliers, products, subscribers and everyone else they have interaction with. Traditionally, business intellig ence has been helping firms analyze their historical data. However, tables turned when Data Analytics gave the power to predict events and suggest actions. What to do with that information, and how to mine it for trends, insights and predictors of future behaviour, has increasingly become a key driver for a successful business. Due to its potential, the past few years have witnessed a phenomenal growth in the reach of data analytics. Big Data Analytics is basically looking for two types of people – those who can channelize large amount of information and those who can translate business problems to analytical problems, while the ability to communicate remains intrinsic to both roles. The domain of analytics is going to be immensely lucrative for young professionals with the right skills, aptitude and attitude. As more and more businesses and government organizations across the world are going to put their faith in data-driven decisions, a plethora of roles are emerging in this – such as Internet of Things (IoT) architect, marketing technologist, technology broker and chief data officer apart from the in demand roles like Data Scientists, Data Engineers, Big Data Analysts, Data Strategist, Data Architect, Data Visualization Analyst, Data Quality Manager etc. Recent Industry salary reports indicate that there is 32% increase in demand with people having Analytics qualifications over and above degrees in IT or business administration or even doctorates (2016) and data scientists earn more than CA's & engineers. A welltrained business analyst is going to be a much soughtafter professional in the foreseeable future.

Who may attend : Engineering Professionals.

7.4.168 Energy Conservation and Energy Audit in Power Utilities

Program Profile

- Potential areas in the Power Industries for energy saving.

- Energy Saving methods with typical examples and exercises for power stations.
- Ways to minimise losses in power transmission & distribution system.
- Better use of electrical energy.
- Proper storage and use of fuel.
- Waste Heat areas and their utilization.
- Co-generation techniques for energy boosting.
- Energy Management System, energy Auditing and their implementation techniques for power industries.

Who may attend: Engineers with 3-4 years experience in Thermal Power Stations**.**

7.4.169 Accelerating Energy Efficiency in India: Initiatives & Opportunities

Program Profile

- Energy Efficiency: Potential and Benefits.
- Energy Efficiency initiatives: Targets, Strategies and Engagement.
- Energy Efficiency in Transport Sector: Potential, Saving measures & Investment.
- Energy Efficiency in Buildings Sector: Potential, Saving measures & Investment.
- Energy Efficiency in Industrial Sector: Potential, Saving measures & Investment.
- Lighting and Appliances - Instruments, Policies, Schemes/Programmes, Innovations.
- Energy Efficiency Finance: Public and Private Sector Investment.
- Energy Efficiency Progress: Examples from Developed and Emerging Economies.

Who may attend: The Workshop is Sector neutral and participation from across Industries, Transportation sector, Municipal corporations, Real estate developers, Researchers, Professionals from academic and R&D Institutions is solicited.

7.4.170 Energy Efficiency in Electrical Utilities

Program Profile

- Three-phase consumers with star and delta connections (R, L, C, RL, RC and RLC loads).
- Measurement with active and reactive energy meters: for symmetric and asymmetric RL loads in the event of a phase failure.
- In the event of over-compensation (RC load) for active loads in the event of energy-flow reversal.
- Determination of the first and second power maxima.
- Determination of the power maximum in the event of an asymmetric load.

Who may attend: Professionals from Power Sector, Engineers, Academicians, Equipment Manufacturers, Researchers, Engineering, Managers.

X. POWER MANAGEMENT PROGRAMS

7.4.171 Regulatory Framework in Power Sector

Program Profile

- Electricity Act 2003 - legal framework, national electricity policy and tariff policy.
- Energy Conservation ActIndian Electricity Grid Code, Regulations and Grid standards-Regulations 2010.
- CEA Regulations, connectivity, metering, construction of electrical lines, AT & C losses.
- Procedures, grant of approval for interstate transmission of power.
- Terms and conditions for Short term open access.
- Renewable energy generation regulations.
- Renewable energy scheduling, dispatch and deviation settlement - Regulations 2015.

Who may attend : System Operators from SEBs, Power Utilities/ Corporation, PSU, R&D Organization, Academic Institution.

7.4.172 Open Access, Power Trading and Tariffs - ABT Scenario

Program Profile

- Open Access in Transmission & Distribution.
- Electricity Act Provisions.
- Power Trading in Multi buyer and multi seller environment.
- Availability based tariff concept and importance.
- Balancing and settlement mechanism.
- Power trading rules in changed scenario.
- Role of Regulatory Commissions.
- Open Access challenges for Power Market.
- Power Exchanges and its functioning.
- Field visits/Demonstration.

Who may attend : Engineers with 2-3 years experience in power trading activity system operations from SEB's/ power utilities/corporations/PSU's R&D organization, Academic Institutions.

7.4.173 Management of Renewable Energy (Solar Energy in Particular); Finance and Economics of Renewable Energy

Program Profile

- Introduction to various forms of Renewable Energy Generation, Solar Energy in Particular.
- Managing Integrity of Renewable Energy to the Grid, Balancing of Grid, Concept of Smart Grid.

- Design aspects of installation of mini/micro Grid Solar Power Plant, Technical & Administrative Issues.
- Introduction to Renewable Energy Finance.
- Tariff Support Schemes.
- Project Finance Calculations.
- Basic Technical Calculations.
- Government Policy and Support Schemes.
- Project Finance Examples with Case Studies.

Who may attend : Individuals considering a consultancy job and/or those who have to evaluate the benefits of adopting renewable energy technology. Industrialists/ Entrepreneurs intending to invest in the Renewable Energy Sector. Working Technical Executives from various Power Sector Stake-Holders and Load Dispatch Centres.

7.4.174 Finance for Non Finance Executives

Program Profile

- Financial Statements - To study Profit & Loss Account and Balance Sheet as well as Cash Flow Analysis and to understand every term of these statements.
- Financial Statement Analysis - To study Ratio Analysis and to assess the financial health of an organization Cost, Selected Cost Terms and Cost Estimation through Overhead Allocation Cost Analysis and Decision Making Financing and the Estimation of the Cost of Capital Investing and the Estimation of Risk Associated.
- Working Capital Management Capital Expenditure Decisions.

Who may attend : All technical and administrative personnel with 2-3 years experience.

7.4.175 Contract Management

Program Profile

- Purchase & Contract Management.
- Key Issues.
- On generation of Indent to Placement of Orders and Closing of Contract.
- E-Procurement and guidelines.
- Benefits of E-procurement over Off-line system of procurement.
- E-tendering.
- Some case studies and analysis.
- Quality Assurance Philosophy.
- Integrated Management System.
- ISO 9001 & ISO 18001 regarding OHSAS, ISO-14000 regarding EMS.

Who may attend : Finance Executives, Engineers, Management Level Executives with 2-3 years experience.

7.4.176 Behavioral Science

Program Profile

- Freuds theory of personality.
- Ice Breaker and warm up activities.
- Personnel Effectiveness and Behavioral skills.
- Personality development – Case Study.
- Evaluation and Human Behavior.
- Models of Human Behavior.
- Activity of Personnel effectiveness and leadership.

Who may attend : Jr. Level, Middle Level, Supervisor Level & Executives (Technical & Non-Technical).

7.4.177 Maintenance Planning & Cost Control

Program Profile

- Aims and objective of maintenance efficient, service, high plant availability, maintenance and planning engineer's duties.
- Integration of maintenance with operational requirements, plant reliability, plant outages and daily work programs.
- Preventive maintenance of running units.
- Planning of major plant overhauls during shut downs.
- Planning techniques-critical path analysis, charting systems etc.
- Purchasing and stores control-standards, cost codes, control of stores and store records.
- Cost control, Direct costs, indirect costs, outage costs, budgeting and costing works, budgetory control.
- Contract procedures, Conditions of contract, project evaluation, interest and depreciation charges.
- Use of computers in maintenance planning.

Who may attend : Engineers/Officers working in Power Stations/Industries with 5-10 years experience.

7.4.178 Electricity Act and Regulation

Program Profile

- Over view of IEA-2003.
- Electricity Grid Code.
- Status of Deregulation and Power Tariff.
- Open access and ABT

Who may attend : Engineers with 2-3 years experience in power trading activity system operations from SEB's/ power utilities/corporations/PSU's R&D organization, Academic Institutions.

7.4.179 Government e-Marketplace (GeM) and General Financial Rules (GFR) 2017

Program Profile

The 5-Day program will enable the participants to:

- Gain an overall understanding of the Government e- Marketplace (GeM) and General Financial Rules 2017.
- Understand how GeM and GFRs 2017 would impact the functioning of your organisation and changes in the procurement process required for compliance.
- Acquire practical knowledge of the different procurement procedures required under GFRs 2017 and GeM such as Registration of Organization, Creation of User Accounts, Placement of Order for Good & services, Receipt of Goods, PRC/CRAC, Bidding and Reverse Auction.

Who may attend: Officers of Central Government Ministries / Departments / State Governments including its attached / subordinate offices, Central Public Sector Units (CPSUs) / PSUs and Autonomous Bodies / Sellers / Service Providers registered on GeM.

7.4.180 Government e-Marketplace (GeM) for Sellers & Service Providers

Program Profile

- Overview of GeM, Terms and Conditions for sellers & services providers, GFRs 2017 – an overall perspective.
- Hands on training on GeM –: Registration of Organization / Creation of User Accounts.
- Overview of GeM, Terms and Conditions for sellers & services providers, upload of product and services on GeM.
- Hands on training on GeM– Acceptance of Order for Goods& Services / Creation of invoice, Acceptance of Payment Procedure for Payment in GeM.
- Hands on training on GeM – Participation in online Reverse Auction and Biding.

Who may attend: Officers of Central Government Ministries / Departments / State Governments including its attached / subordinate offices, Central Public Sector Units (CPSUs) / PSUs and Autonomous Bodies / Sellers / Service Providers registered on GeM.

7.4.181 Procurement Procedures & Contracting

Program Profile

- Introduction & Concept of Public Procurement, Purchase Planning, Cost estimation & Indenting
- Tendering, Bidding & Contents of Bid documents
- Bid opening & Evaluation
- Issue of Letter of Award
- Post Award Execution
- E-Procurement
- General Financial Rules (GFR) relevant for procurement / Contracting
- Import purchasing
- Indian Contract Act
- INCOTERMS 2010
- Arbitration & Conciliation Act
- Bank Guarantees
- Taxes & Duties relevant for procurement
- Various types of insurance activities
- Procurement of Goods through Government-E-Market (GeM)

Who may attend: Officers of Central Government Ministries / Departments / State Governments including its attached / subordinate offices, Central Public Sector Units (CPSUs) / PSUs and Autonomous Bodies / Sellers / Service Providers registered on GeM.

7.4.182 Regulatory Issues in Power Sector

Program Profile

The course will include topics that directly address regulatory approaches aimed at enhancing the financial health of the Distribution Utilities by:

- Controlling Aggregate Technical and Commercial (AT&C) Losses.
- Improving efficiency.
- Improving the quality and reliability etc., of customer service.
- Economic, legal, and social rationale for electricity regulation.
- Role of regulation under the new legislation and economic environment.
- Types of regulation and making approaches.
- Regulation of quality of electricity supply and services.
- The role of the Middle Management executives of the utilities under independent regulatory framework.

Who may attend : Executive Engineer, Assistant Engineer, Deputy/Accounts Officer (or) any other equivalent rank mentioned above.

7.4.183 Leadership Skills and Stress Management

Program Profile

- Integrity.
- Development of Ability to delegate and effective Communication.
- Self-awareness and Gratitude.
- Learning agility and Empathy.
- Human body and stress
- Reason for stress
- Identification of stress
- Stress management techniques

- Healthy life style for stress management

Who may attend: Engineering and Management Professionals.

7.4.184 Human Resource Development Program for Finance Officer/ Manager

Program Profile

- Personality Development – Skills
- Attitudinal Development, Leadership, Team Building, Value & Ethics.
- Business Communication skills, Negotiation.
- Man Power Planning (MPP).
- Beyond the Present Role: Potential Systems.
- Quality of work Life (QWL).

Who may attend: Finance persons working in Power Stations/Industry with 5 to 10 years of experience.

XI. ENVIRONMENTAL MANAGEMENT

7.4.185 Environmental Issues in Thermal Power Stations and FGD Technology

Program Profile

- Introduction to air and noise pollution.
- Noise and air pollution control legislation.
- Nature of air and noise pollution and its effect including pollution control methodology.
- FGD Technology for flue gas treatment.
- Noise and air pollution measurements & Control mechanisms including few case studies like Bhopal and green tribunals.
- Introduction to water pollution monitoring and analysis.
- Effect of water pollution, pollution control legislation.
- Removal of pollutants from waste water – sewage and sludge treatment.
- Zero discharge concepts Case studies of water pollution control implementation.
- Method of Environment Impact.

Who may attend : Junior / Senior Engineers of any process and power plant, Operational personnel Policy makers with 2-3 years experience.

7.4.186 Environmental Pollution & Pollution Control Related to Power Plants Engineering

Program Profile

- General description of different types of Industrial Pollution.
- Introduction to Air, Water and Noise Pollution.
- Nature of Air Pollutants.
- Water quality and health.
- Role of air and Noise Pollution control in modern society.
- Pollution control theory.
- Noise & Air Pollution Measurement & Equipment, the role of waste water treatment and the removal of Toxic Pollutants.
- Sewage and sludge treatment.
- Effects of pollutants in the Acquatic environment.
- Evaluation Pollution Effects on Plant Productivity.
- Legislation and the control of Air, Noise and Water Pollution.

Who may attend : Engineers/Chemists working in process Industry/Power Stations.

7.4.187 Air Pollution Monitoring & Control Technologies

Program Profile

- Basics of Air pollution control.
- Combustion control & No, Reduction.
- Dust Collector Mechanisms.
- Flue Gas desulphurisation.
- Denitrification of Exhaust Gas.
- Toxic Gas Treatment.
- Measurement of Air Pollutants.
- Environment monitoring system.
- Environment Impact Assessment Test.

Who may attend : Engineers/ Managers/ Researcher/ PG student

7.4.188 Environmental Impact Assessment and Environment Management Plan

Program Profile

- Methods for Environment Impact Assessment.
- Analysis of Envionment Management Plant.
- Intepration of Environment and Impact Assessment.

Who may attend : Engineers/Faculties/ Research Scholars/ PG students. XII Other Training Programs As Per The Requirement Of Client On Mutually Agreed Basis

7.4.189 Maintenance & Protection of Transformers

7.4.190 Emergency Operation of TPS and Power Plant Safety

7.4.191 Zero Accident Mindset to Protect Personnel Environment and Equipment

7.4.192 Potential Hazards in Power Plant

7.4.193 Safe Handling Procedures in Mechanical/ Electrical (Rotary and Static)

7.4.194 Fire Hazards in Power Plant

Session by Padma Shri Janak Palta McGilligan on Sustainability and life

Two days National Conference on Shaping Sustainable Future of India with Green Power organised by NPTI ER Durgapur during 19-20.3.24 with technical topical contents

7.5 TRAINING & CAPACITY BUILDING FOR DISCOM EMPLOYEES UNDER REVAMPED DISTRIBUTION SECTOR SCHEME (RDSS)

7.5.1 Job Role-1: Introduction of AMI and Role of AMI in Reducing AT&C Losses

Program Profile

- Overview of RDSS & Smart Meters, Advanced Metering Infrastructure, Smart Meter Policy and Regulations
- Smart Meter data exchange protocol, Communication network components and technology selection, Overview of Service Level Agreements (SLAs)
- Business models (TOTEX, OPEX etc.), SLA/ SBD, and Regulatory requirement in smart meter implementation

Who may attend: Discom Employees

7.5.2 Job Role-2: AMI system design and program management

Program Profile

- Consumer awareness about Smart Meters and benefits of Smart Meters, Policy, regulations and Standards of Smart Meters, AMI System components design and Integration, mapping of Components.
- Interoperability of smart meters with HES of different OEM, Meter data acquisition system and Meter Data Management System (MDMS) for Data Analytics
- AMI Consumer design aspects for Critical Peak Pricing, Time Of Use, Variable Peak Pricing etc.

Who may attend: Discom Employees

7.5.3 Job Role-3: IT / Communication Technology in smart metering

Program Profile

- Advanced Asset Management, Asset Utilization and Operational Utilization, Distributed Energy Resource for AMI Interface.
- Distributed Energy Resource Management System (DERMS) with Net Metering Facility, Systems Integration with billing and metering Services, IoT application for Smart Meters
- Consumer Advising and customer information systems (CIS) &billing systems, Key Meter Data Indicators (KMDI), Meter Communication configuration check list for Meter data mapping, Testing and Validation process of Smart Meters and System deployment practices like Public and Private Cloud, Cyber Security aspects of Smart Meters

Who may attend: Discom Employees

One Week Practical Training program under SANKALP SCHEME on
"Power Genration Technology" held at NPTI, Shivpuri

7.5.4 Job Role-4: AMI data analytics and data applications

Program Profile

- Advanced distribution automation and Smart Meters Integration, Trouble Shooting in Smart Meter Operation and AMI Analytics Centre, Trouble Shooting in Smart Meter Operation and AMI Analytics Centre, Integration with Information and Management Systems, Overview of Customer System Like Direct Load Control Device (DLCD), Programmable Communicating Thermostat, In Home Display, Energy Management System, Data Application Server Public or Private and Comparison of Physical versus Cloud hosting. Block Chain Technology and Big data Analytics.

Who may attend: Discom Employees

7.5.5 Job Role-5: SCADA, IT/OT Technologies and DMS & OMS System

Program Profile

- Over View of SCADA and Components of SCADA System
- Overview of Applicable standards, Protocol and General Requirement of SCADA and DMS system. SCADA/DMS/OMS, Functions, Functional requirement and Integration, Role and Responsibility
- SCADA Implementation Agency (SIA) under RDSS, Technical and Functional Requirement of RTU, FRTU, RMU, FPI, MFT, MODEM, Battery and Auxiliary Power Supply System, Cyber Security, API requirement for Data Exchange & Integration, Cyber Audits, Database maintenance & mimic creation and SLA of SCADA

Who may attend: Discom Employees

Capacity Building on Energy Conservation and Energy Walk through Survey for Girls Students in Uttar Pradesh's Schools (KGBVS) under UPNEDA.

Technical visit to GIS Substation, Powergrid Academy of Leadership, Manesar, Gurugram

Technical visit to AIS, Powergrid, Ballabhgarh

7.6 MANAGEMENT DEVELOPMENT PROGRAMS

7.6.1 Business Intelligence, Data Visualization and Dash boarding and Data Mining

Program Profile

- Participants at the end of the course will develop hands on skills in the following areas: Data Wrangling and Data Reshaping skills including the ETL skills (Extraction, Transformation and Loading Skills) – including data modeling skills Generate Insights and intelligence from the data quickly Understand the different types of charts and visuals Visually represent data through interactive dashboards and scorecards Dashboard implementation in PowerBI, Tableau and Excel Publishing and deploying dashboard over cloud

Who may attend: The program is suitable for all staff members across all departments who are engaged in analysis of data. There is no pre-requisite other than basic familiarity with computer and Microsoft office and basic knowledge of excel. The program will cover the topics in a comprehensive way from beginner to advance level.

Pre-requisite: Participants are expected to bring windows laptops.

7.6.2 Data Science and Analytics

Program Profile

- The 5 day program is expected to provide participants an intense but friendly exposure to Data Science methodologies
- No prior background in statistics or programming is required. This is the beginner's course. The course is meant to kick start the journey to learn analytics – the focus is application of analytical methodologies to solve real world problems of prediction or classification.
- The program is specially designed for both non-engineering students as well as engineering students who do not have exposure to analytics.

Who may attend: The program is suitable for all staff members across all departments who are engaged in analysis of data. There is no pre-requisite other than basic familiarity with computer and Microsoft office and basic knowledge of excel. The program will cover the topics in a comprehensive way from beginner to advance level.

Pre-requisite: Participants are expected to bring windows laptops.

7.6.3 Robotic Process Automation and Cloud Services for Power Utilities

Program Profile

- The program is application oriented - participants will experience rapid skill development in understanding digital processes automation. This is a handson course with participants working hands on to develop skills to automate various processes.
- Course materials include Practice Playbooks, Tutorial handouts, shared drive knowledge repository and Exercise files.
- experience of creating digital robots that automate real operational, financial and compliance processes
- Gartner, the world leader in IT research, names Microsoft Power Automate and UiPath as the world's best and leading platform for digital process automation. Both these platforms will be covered in the Training Program including cloud services using Microsoft Azure

Who may attend: The program is suitable for all staff members across all departments who are engaged in analysis of data. There is no pre-requisite other than basic familiarity with computer and Microsoft office and basic knowledge of excel. The program will cover the topics in a comprehensive way from beginner to advance level.

Pre-requisite: Participants are expected to bring windows laptops.

NPTI Faridabad conducted One-week Management Development Program on Data Sciences and Analytics