**DESIGN, ERECTION, OPERATION, MAINTENANCE AND PROTECTION OF EHV SUB-STATIONS**

**Duration: 6 Weeks**

**AIM**

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

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

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

**OBJECTIVE**

* Orientation towards the state–of–the –art technologies in the design of EHV substations
* Equip with necessary skills in the Operation and Maintenance of EHT substations including protection aspects
* Condition Monitoring and enhancing the life of the equipment by adopting effective operation and maintenance practices and modern condition monitoring techniques.

**CONTENTS OF THE COURSE**

**Introduction to Power Sector**

Power sector scenario in India and Organizational setup

Electricity Act 2003 and National Electricity Policy and growth of Indian power sector

Regulatory mechanism - India’s & International experience

**Design and construction of EHV substations**

Salient aspects of Sub-Station Design: EHT substations layouts and Bus bar arrangement to be adopted, lightning impulse and switching impulse withstand levels, insulation coordination and selection of Lightning Arrestors, Measuring soil resistivity and design of earth mat and lightning protection, Soil analysis and specific considerations in foundation design, Design aspects of substation main and auxiliary structures , Design of station lighting system, Civil aspects covering yard levelling, controlling room, station drains, internal and approach roads, fencing, etc.

Design of communication system for data transmission and protection covering PLCC and OPGW

**Commissioning and testing of sub stations**

Salient features, Selection and economical procurement of EHV class Power Transformers; and substation equipments and erection practices.

Substation construction practices

**Sub Station Protection Issues:**

Salient features of substation protection systems

AC and DC systems including battery capacity calculations

Transformer, Bus Bar and Equipment Protections and Schemes, Digital Techniques in protection

**Condition monitoring of EHV Substations and Best Practices in O&M**

O&M of Power Transformers and substation equipments, operational problems; maintenance practices and troubleshooting

Condition Monitoring and Hotline maintenance practices

**Advanced topics**

Gas Insulated Substations

Substation Automation & SCADA,SAS, Outage management

**General Management:**

Change Management, Time Management & Business Communication, Work Life Balance

**Field visits:**

Field Visit to a 400/220 KV SS and a Gas Insulation Substation

Protection Systems