Course goal
The course goal is to give students fundamental knowledge of Power Generation Technology and an overview of functionality and operation of the main components.

Main learning objectives
The participants will be able to:
— Describe the layout of a specific power plant
— Identify the main components and describe their characteristics
— Outline operation and installation of components
— Describe main plant operation steps and maintenance measures
— Describe function of related Power Generation System

Participant profile
Supervisors, design and planning personnel, engineering and application personnel, maintenance and operating personnel and consultants from the Electricity Supply Industry. Sales and technical personnel from ABB companies.

Prerequisites
Electrical or mechanical engineering degree, technical college qualifications or equivalent. Basic knowledge of power generation and process control is recommended.

Topics
POWER PLANT TURBOMACHINES
— Fundamentals: Design, classification, physical concepts and basic laws.
— Hydraulic machines: Application, function and operation of turbines and pumps.
— Turbocompressors: Construction, principles, operation range and protection.
— Gas- and steamturbines: Function and classification, principles, starting steps and operation modes.

TURBOGROUP DESIGN AND INSTALLATION
— Turbomachines installation: General projects, classification. Identification of main components.
— Generator and exciter machines: Basic performance of a turbogenerator. Static and brushless excitation.
— Fixed components: Casing, assembling and fixation. Fixed points and expansion control.
— Rotating components: Design, adjustments and basic measurements. Sealing, axial and radial bearings.
— Alignment: Different couplings and shaft line in operation. Machine and rotor alignment

PROCESS SYSTEM DESCRIPTION
— Power plant visit: Visit of a selected Power plant. Identification components, reviewing design aspects.
— Process systems: Documentation (P & ID’s, SLD’s, Instructions), classification.
— Primary systems: Flow path, start-up and operation modes of oil systems.
— Secondary systems: Cooling, sealing & blow off systems, function and operation modes.
— Steam water cycle: Design of Boilers and HRSG’s, steam process systems, flow path and basic function
— BOP systems: Selection of BOP systems e.g. closed cooling water, etc.
— CCPP process cycle

START-UP AND OPERATION MODES OF A CCPP, CONTROL SYSTEM
— Gasturbine process: Design of open and closed loop controllers. Actual regulators, speed and load control, function diagrams.
— Startup sequence: Preparation, standstill checks, start-up, and ignition. Check points. Synchronizing & loading characteristics.
— Typical starting failures: Problems during start-up. Trouble-shooting sequence and solutions.
— Operation modes: CCPP, including HRSG and steamturboset, considering power output and network condition.
— Gasturbine protection: Drive and group control, hardwired units for supervision and protections.
— Shutdown sequence: Normal shutdown with deloading gradient, idling and rundown. Emergency shutdown.
— Control System: Introduction to Automation Platform and philosophy. Design example

MAINTENANCE AND TROUBLE-SHOOTING (optional)
— Output and efficiency: Calculation of power output and efficiency of a CCPP, influence factors.
— Important contaminants: Possibilities of fouling of compressors and turbines, Blade Corrosion.
— Standstill maintenance: Planning, manufacturers recommendations, procedures of an overhaul, checklist. Important measurements

Course type
This is a face to face class room training with maximum 8 participants.

Learning methods and tools
Lectures, demonstrations, applied exercises, discussions and a plant visit. Laptop or tablet is required to have access to the e-documentation.

Duration
4 days (5 days incl. chapter “Maintenance and -Troubleshooting”)

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