

This course can be adapted to virtual classroom mode

## From Gas to Energy

5 days  
Overview

ENERGY-EN-A

### LEVEL

Knowledge

### PURPOSE

This course provides a comprehensive technical and economic review of the natural gas processing and its use to produce energy through thermal power plants and combined cycles.

### LEARNING OBJECTIVES

Upon completion of the course, participants will be able to:

- acquire technical knowledge and practical approach of energy production facilities (technology and operating principle of the equipment),
- explain the basics of natural gas production, processing and transport,
- understand economics of gas and power supply markets, explain how a power plant works,
- detail the available process technologies allowing to produce energy efficiently,
- be aware of innovative technology deployed over the world.

### WAYS AND MEANS

Numerous application exercises inspired from gas production and thermal power plant.

### LEARNING ASSESSMENT

Assessment by test at the end of the course.

### PREREQUISITES

Engineer degree or equivalent experience in the gas industry.

## Agenda

### NATURAL GAS PRODUCTION OVERVIEW

1.5 d

Types and characteristics of natural gas fields. Production techniques.  
Different types of natural gases (condensate, wet or dry gas) and characterization parameters.  
Natural gas processing:  
Gas dehydration (drying) and hydrate formation inhibition.  
Gas sweetening: removal of acid components (H<sub>2</sub>S and/or CO<sub>2</sub>).  
Natural Gas Liquids (NGL) extraction (removal of heavy components).  
Examples of gas field development schemes.  
Transport:  
Transport and storage of natural gas in gas phase.  
Transport of natural gas in liquid phase. LNG option and regasification.

### ECONOMIC ASPECT

0.5 d

Gas markets: natural gas reserves and production, worldwide gas demands distribution, international natural gas trade.

Gas contracts, specificities of LNG contracts, pricing, shipping contracts.  
Power supply markets trends and deployment over the world.

## THERMAL POWER PLANT OVERVIEW

1 d

Introduction to Steam Power Plant (SPP).  
Overview of characteristic equipment.  
Characteristics of simple cycles associated to SPP:  
Carnot cycle.  
Rankine cycle.  
Overview of existing cycle.  
Notion of energetic performance. Energy measurement:  
Energy balance.  
Energy efficiency.  
Safety associated with this kind of installation.  
Environment consideration.  
Overview of existing plant P&ID.

## TECHNOLOGY OF THERMAL POWER PLANT EQUIPMENT

1 d

Boilers:  
Boilers description and operating conditions.  
Combustion. Burners.  
Steam production.  
Boiler operation and safety in operation.  
Steam turbines. Gas turbines:  
Turbine performance.  
Technology.  
Turbine control systems, operation and safety in operation.

## OVERVIEW OF COMBINED POWER PLANT

0.5 d

Combined cycles: gas/steam.  
CHP (Combined Heat and Power):  
Steam production.  
Steam end-uses.  
Gas turbines and waste heat recovery.

## SOLAR & THERMAL POWER PLANT OVERVIEW

0.5 d

Concentrating solar power plant:  
Current technology: parabolic through, solar power tower, Fresnel reflectors.  
Efficiency and costs.  
Deployment over the world. Overview of existing plant.