



RE058: Evolving Power Generation: Gas Turbines, Combined Cycle, Wind, & Solar Technologies

Training Description:

The global energy landscape is undergoing a major transformation driven by the need for cleaner, more efficient, and more sustainable power generation solutions. This training course provides participants with a deep understanding of evolving power generation technologies—spanning **gas turbines, combined cycle plants, wind energy, and solar power systems**. It covers fundamentals, design, operation, performance optimization, and integration challenges in modern power grids. Practical insights, case studies, and comparative analysis of technologies are included to equip professionals with knowledge relevant to today's energy transition.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Understand the principles, design, and performance characteristics of **gas turbines, combined cycle, wind, and solar technologies**
- ✓ Compare advantages, limitations, and applications of conventional vs. renewable power generation
- ✓ Analyze **efficiency improvements, emissions reduction, and digital monitoring trends**
- ✓ Evaluate the challenges of integrating renewable energy with conventional thermal systems
- ✓ Apply practical knowledge to **operation, maintenance, and optimization** of power generation assets

Training Designed for:

This training course is intended for Power plant engineers, operators, and maintenance staff, Energy and utility company professionals, Project managers in power and renewable energy projects, Electrical/mechanical engineers in power and industrial sectors, Energy policy analysts, regulators, and consultants, Academics and researchers in energy and sustainability fields.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Introduction & Gas Turbine Technologies
 - Global energy transition: drivers & challenges
 - Role of gas turbines in modern power generation
 - Fundamentals of gas turbine operation (Brayton cycle)
 - Major components: compressor, combustor, turbine, auxiliary systems
 - Performance factors: efficiency, power output, fuel flexibility
 - Maintenance practices and reliability concerns

- **Case study:** Latest advances in heavy-duty and aero-derivative turbines

DAY TWO:

❖ Combined Cycle Power Plants (CCPP)

- Principles of combined cycle (Brayton + Rankine cycles)
- HRSG (Heat Recovery Steam Generator) design and operation
- Efficiency improvements and load flexibility
- Environmental considerations: NO_x, CO₂, and emissions reduction
- O&M strategies for combined cycle plants
- Case study: World's most efficient CCPP installations
- Digitalization and AI in monitoring and optimization

DAY THREE:

❖ Wind Energy Technologies

- Fundamentals of wind power generation
- Types of wind turbines: onshore vs offshore
- Aerodynamics and rotor design
- Power curves, capacity factors, and resource assessment
- Grid integration challenges and intermittency issues
- Operation, maintenance, and reliability of wind farms
- **Case study:** Offshore wind mega projects

DAY FOUR:

❖ Solar Energy Technologies

- Fundamentals of solar power generation
- Photovoltaic (PV) technology: materials, design, and efficiency trends
- Concentrated Solar Power (CSP): principles and applications
- Storage solutions (batteries, molten salts, hybridization with gas/CCPP)
- Performance optimization and maintenance challenges
- Environmental and economic aspects of solar power
- **Case study:** Utility-scale PV vs CSP plant comparison

DAY FIVE:

❖ Integrated Systems & Future Trends

- Hybrid power plants: combining gas turbines with renewables
- Energy storage integration (batteries, hydrogen, pumped hydro)
- Smart grids and digital transformation of power generation
- Policy, regulation, and incentives shaping the energy mix
- Roadmap for decarbonization: role of gas, wind, and solar
- **Workshop:** Designing an optimal power mix for a sample country

❖ Course Conclusion

❖ POST-ASSESSMENT and EVALUATION

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical

Exercises, Gamification, Software & General Discussions

- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA As per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

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