MERCURY

Evolving Power Generation: Gas Turbines, Co-Generation, Combined Cycle, Wind, & Solar

4 – 8 April 2027
Cairo (Egypt)



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Ref: 8027_261915 **Date:** 4 – 8 April 2027 **Location:** Cairo (Egypt) **Fees:** 3500 Euro

Evolving Power Generation: Gas Turbines, Co-Generation, Combined Cycle, Wind, & Solar is a 1-week professional conference course reviewing heat recovery assets, rotating machinery, and renewable utility assets. Designed for technical specialists, operations coordinators, and project sponsors advancing toward gas turbine certification pathways, participants assemble the Hybrid Generation Asset Evaluation Matrix. The course is delivered by Mercury Training Center.

About This Course

Navigating the transition toward decarbonized grids requires balancing combustion turbine dispatch with volatile solar and wind production. To participate effectively, you should already monitor mechanical equipment or track utility output metrics. You practice by analyzing heat recovery steam generators, checking compressor surge limits, and assessing levelized production costs.

Who It Is For

- Asset engineers responsible for operating thermal combustion sets, steam units, and waste heat recovery installations
- Renewable project developers responsible for evaluating photovoltaic output, wind resource reliability, and grid interconnects
- Technical services supervisors responsible for vibration monitoring, balancing protocols, and rotating machinery overhauls
- Energy economists responsible for modeling co-generation steam allocations, fuel conversion efficiency, and emission thresholds

This course is not for field mechanics seeking hands-on valve machining practice, who are better served by a mechanical fabrication apprenticeship, nor for entry-level billing clerks needing elementary utility math, who are better served by an introductory energy accounting seminar.

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Competencies You Will Build

- Thermal Cycle Appraisal: you calculate net heat rates and evaluate thermodynamic recovery efficiency across combined cycle configurations
- Turbomachinery Aerodynamics: you identify dynamic compressor stall, surge boundaries, and dry gas seal integrity during load swings
- Co-Generation Allocation: you optimize steam extraction ratios and district energy dispatch against thermal energy demands
- Renewable Asset Integration: you quantify capacity factors and inverter stability margins for utility-scale photovoltaic and wind farms
- Auxiliary Electrical Protection: you inspect synchronous generator excitation fields, bus duct isolation, and step-up transformer health
- Asset Transition Governance: you apply certification body technical standards to align capital overhauls with regional carbon limits

What You Will Be Able to Do

By the end of the course you will be able to:

- From original equipment manufacturer specifications, diagram thermal energy balances and heat recovery steam generator pinch points
- Given centrifugal compressor operating curves, establish anti-surge valve setpoints and monitor dynamic seal differential pressures
- Using hourly thermal host demand profiles, evaluate extraction steam turbine performance and co-generation operating economics
- From wind turbine power curves and solar irradiance logs, calculate expected capacity factors and battery storage integration limits
- Using transformer oil dissipation logs and generator insulation readings, assess electrical balance-of-plant reliability and excitation status
- From fleet emission monitoring data, prepare regulatory compliance documentation to satisfy professional certification criteria

Course Content

Day 1: Thermal Foundations and Steam Generation Infrastructure

- Thermodynamic Rankine Cycle Analysis and Supercritical Steam Configurations
- Water-Tube Boilers, Reheaters, and Drum Pressure Control Philosophy
- Condenser Vacuum Dynamics, Deaerators, and Feedwater Preheating Stages
- Co-Generation Steam Turbine Extraction Architectures and District Thermal Supply
- Economics of Industrial Steam Raising and Fuel Energy Ratio Benchmarking

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Day 2: Gas Turbines and Dynamic Compressor Mechanics

- Brayton Cycle Efficiency Parameters and Turbine Combustor Configurations
- Dynamic Compressor Aerodynamics, Stall Mitigation, and Anti-Surge Systems
- Centrifugal and Axial Compressor Dry Gas Seals and Magnetic Bearings
- Combined Cycle Configuration Options and Single-Shaft Train Design
- Exhaust Energy Recovery Steam Generators and Supplementary Firing Options

Day 3: Wind and Solar Renewable Integration

- Doubly-Fed Induction Generators and Wind Farm Aerodynamic Conversion Curves
- Utility Photovoltaic Arrays, String Inverters, and Interconnection Protocols
- Levelized Cost of Electricity Across Variable and Baseload Assets
- District Heating and Steam Distribution Optimization Case Studies
- Emissions Monitoring Technologies and Compliance Reporting Thresholds

Day 4: Electrical Conversion, Generators, and Substation Assets

- Synchronous Generator Stator Cores, Rotor Forgings, and Excitation Topologies
- Step-Up Transformers, Winding Insulation Assessment, and Dielectric Checks
- Vibration Spectrum Analysis and Dynamic Rotor Balancing Diagnostics
- Protective Relays, Synchronization Windows, and Bus Protection Schemes
- Condition-Based Predictive Overhaul Scheduling for Rotating Assemblies

Day 5: Portfolio Evaluation and Synthesis

- Exercise Modeling Combined Cycle Thermal Heat Rates Under Variable Ambient Temperatures
- Exercise Balancing Co-Generation Steam Extraction Against Photovoltaic Surges
- Exercise Diagnosing Rotor Vibration Anomalies and Generator Winding Insulation Faults
- Certification Framework Review for Professional Power Generation Practitioners
- Completing and Presenting the Hybrid Generation Asset Evaluation Matrix

Case Studies and Exercises

The following are suggested activities used during the course.

- Case study: an industrial manufacturing complex operating a co-generation steam plant; you balance process heating demands with backpressure turbine electrical yield.
- Case study: a utility operator hybridizing a combined cycle station with a solar photovoltaic farm; you calculate dispatch ramp rates and fuel savings.
- Exercise: an offshore energy platform experiencing compressor surge symptoms; you determine anti-surge controller margins and evaluate dry gas seal leakage.
- Exercise: a transmission operator integrating a wind farm; you analyze reactive capability curves and identify step-up transformer tap settings.

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What You Take Back

You return with the Hybrid Generation Asset Evaluation Matrix to appraise fleet equipment and justify capital modernization projects. In your first month back, you use it to benchmark plant thermal efficiency, review rotating equipment diagnostic alerts, and structure technical documentation for certification pathways.

- Thermodynamic cycle calculation spreadsheets and heat rate assessment worksheets
- Turbomachinery anti-surge setting guidelines and vibration tolerance review charts
- Renewable capacity factor estimating tools and grid interconnection verification checklists
- Asset health diagnostic scorecards for generators, step-up transformers, and auxiliaries

Quick Answers FAQ

What should I know before Evolving Power Generation: Gas Turbines, Co-Generation, Combined Cycle, Wind, & Solar?

You should understand basic industrial physics, thermodynamics fundamentals, and standard mechanical equipment terminology. Practical exposure to plant operations, rotating machinery maintenance, or substation utility circuits will help you complete the quantitative exercises.

How does this course differ from dedicated steam turbine maintenance training?

Dedicated maintenance training focuses exclusively on mechanical teardown, alignment, and bolt-torque procedures for steam hardware. This conference course evaluates integrated energy portfolios, combining gas turbines, co-generation, renewable generation arrays, and electrical conversion systems within a broader certification pathway.

Why are utilities integrating renewable resources alongside gas turbine combined cycles?

Integrating renewable resources alongside flexible gas turbines provides grid stability while reducing fuel burn and carbon emissions. Fast-ramping thermal units balance the intermittency of solar and wind generation, maintaining voltage and frequency across changing industrial demand cycles.

What work product do I take back from the course?

You take back the Hybrid Generation Asset Evaluation Matrix. This workbook contains thermal balance calculators, turbomachinery health checklists, renewable capacity factor estimators, and equipment risk registers to evaluate facility modernization and support professional certification documentation.

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For Your Manager

This course equips your technical specialist to evaluate mixed generation assets, optimize co-generation efficiency, and resolve rotating equipment reliability concerns. The attendee returns with the Hybrid Generation Asset Evaluation Matrix, which your facility can immediately apply to analyze heat rates, justify capital upgrade proposals, and verify operational compliance with professional technical standards.