



## Certified Energy Manager® Training Program

*A Certified Energy Manager (CEM®) is an individual who optimizes the energy performance of a facility, building, or industrial plant. The CEM is a systems integrator for electrical, mechanical, process, and building infrastructure, analyzing the optimum solutions to reduce energy consumption using a cost-effective approach. CEM's are often team leaders and help to develop and implement their organizations' energy management strategies.*

### About this Program

AEE's premium training program is recognized across industry for providing energy professionals a holistic "big-picture" view of energy management for non-residential buildings and facilities. Over five days, attendees learn everything they need to know to optimize systems to help reduce costs, improve profits, and increase occupant satisfaction.

### What You Will Learn

- Learn energy management from a global perspective, but also understand applicable codes, standards, and policies for your region or country.
- Learn how systems and energy-saving technologies can be used throughout a building, such as HVAC, lighting, motors, boilers, energy storage, CHP, etc.
- Learn how energy management strategies and practices, such as energy audits, or M&V, can help identify energy savings and reduce costs.
- Understand the economic aspects of energy management that you need to know for procurement, supply, and project financing.

### At-a-Glance

- » This training program prepares attendees to take the Certified Energy Manager® (CEM®) exam.
- » This program is held over 5 days.
- » You earn 3.3 CEU | 33 PDH | 6.6 AEE Credits for completing this program.

### Key Takeaways

- » Work through practical examples to demonstrate the topics and procedures covered.
- » Review the various areas of the Body of Knowledge associated with AEE's certification exam.
- » Discuss one-on-one with an instructor how to apply what you have learned to your business and applications to improve profitability.
- » Leave with a course workbook that will become an invaluable desk reference.

### Registration

Candidates should contact their local AEE approved training provider for information about available training programs, the certification application process, exam registration, and associated fees. To find your local training provider visit

[aeecenter.org/training](http://aeecenter.org/training)

# Certified Energy Manager®

## Training Program

### Who Should Attend?

This course is designed to help energy professionals, including energy managers, energy engineers, facility and business managers, industrial engineers, supply chain professionals, utility officials, consultants, contractors, financial officers, and energy service company professionals become more aware of and effective at identifying and implementing the best energy management strategies. This mix of energy professionals and the learning environment also provides attendees an excellent opportunity for peer-to-peer learning and networking.

### Course Outline

- Why Energy Management is Important
- Energy Basics
- Fuel Supply and Pricing
- Energy Audits and Instrumentation
- Codes and Standards
- High Performance Green Buildings
- Energy Accounting and Economics
- Electrical Power Systems
- Motors and Drives
- Lighting Systems
- Maintenance and Commissioning
- HVAC Systems
- Building Envelope
- Building Automation and Control Systems
- Thermal Energy Storage Systems
- Boiler and Steam Systems
- CHP Systems and Renewable Energy
- Industrial Systems
- Energy Savings Performance Contracting
- Energy Savings Measurement and Verification

### Our Instructors

The CEM multi-day program is taught by approved instructors with extensive experience in the industry. They present the latest practices, strategies, and theories, while leading discussions in an open, interactive environment. You also spend invaluable time connecting with and learning from, other program attendees. In each topic covered, the instructors focus on the most “useful” and “proven” activities that an energy manager should pursue to improve profits.

### Certification Eligibility

The prerequisites to qualify for the certification process take into account the diverse education and experience applicants may have. Each candidate must meet the required criteria at

[aeecenter.org/cem](http://aeecenter.org/cem)

### Global Training Programs

For a complete list of AEE training programs delivered globally visit

[education.aeecenter.org/global](http://education.aeecenter.org/global)

### Accreditation and Recognition

The Certified Energy Manager (CEM®) accreditation is one of the most globally respected in the field of energy management. Since 1985, professionals from over 100 countries have participated in AEE's approved CEM® training programs. For a full list of organizations that have recognized or accredited the CEM® program visit

[aeecenter.org/cem](http://aeecenter.org/cem)

# Certified Energy Manager®

## Training Program

### Daily Agenda

#### Day 1

##### Why Energy Management is Important, become aware of:

- Global trends on Energy, Economy and Our Environment
- Non-Technical Drivers that Create the Need for Energy Projects
- Selling Points for Energy Projects

##### Energy Basics

- Energy Fundamentals
- Energy Conversion Factors and Application
- Comparing Energy vs. Power

##### Fuel Supply and Pricing

- Overview of Utility Rate Components
- Electric and Natural Gas Energy Procurement
- DSM and Demand Response
- Benchmarking Energy Information

##### Energy Audits and Instrumentation

- Energy Programs (ISO 50001, DOE and EPA Resources)
- Audit Strategies/Approaches
- Benchmarking, Level I, II, and III Audits (ASHRAE Standard 211-2018)
- Investment Grade Audits
- Reports
- Data Collection Technologies and Instruments Related to Energy Systems
- Data logging and Communication Technologies

##### Codes and Standards

- Scope of Relevant ASHRAE Standards (55.1, 90.1, 135, 189, 62.1)
- How ASHRAE Standards Affect Green Energy and Federal Building Energy Codes
- Ability to Estimate Minimum Air Flow Requirements (Ventilation Rate Procedure)

##### High Performance Green Buildings

- Leadership for Energy and Environment Design (LEED) Program and Benefits
- Energy Star Program and Benefits

#### Day 2

##### Energy Accounting and Economics

- Economic Analysis and Terminology
- Time Value of Money (TVM) Tables/Compound Interest Factors
- Calculate Key Financial Metrics: Net Present Value, PV, Life Cycle Cost, IRR, SIR and Simple Payback

##### Electrical Power Systems

- Electrical Basics (DC/AC, Single and 3-Phase Power)
- Resistive and Inductive Loads, Power Factor
- Voltage Imbalance, Grounding and Harmonics
- Estimating Savings from Power Factor Improvement
- Important 3-phase Motor Equations and Estimating Power Consumption

##### Motors and Drives

- Savings Considerations: Lifecycle vs. First Cost for Installing Energy Efficient Motors/VSDs
- Motor Terminology and Performance Factors
- Load Factors and Ability to Estimate Motor Loads
- Centrifugal Devices: Fan/Affinity Laws
- Variable Volume Options and Frequency Drives (VFD)

##### Lighting Systems

- Lighting Retrofits: Evaluate and Identify Opportunities for High Energy Saving Potential
- Lighting Design Basics and Terminology
- How to Avoid Common Mistakes of Lighting Retrofits
- Practical Approaches to Audits and Upgrades

##### Maintenance and Commissioning

- Useful Maintenance Technologies
- Basic Terminology and Common Maintenance Strategies
- Estimating Savings from Maintenance Activities (Compressed Air and Steam Leaks, Uninsulated Steam Lines, Group Relamping)

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## Training Program

### Daily Agenda Continued

#### Day 3

##### HVAC Systems

- Types and Functions of HVAC Systems
- Vapor Compression Cycle, COP, EER, SEER, IPLV
- HVAC Energy Efficiency Measures
- Distribution Systems
- Psychrometric Chart and Processes
- Sensible and Latent Heat Transfer Calculations

##### Building Envelope

- Conduction, Convection, Radiation, and Infiltration
- Conductivity, Conductance, and R Values
- Sources of Building Heat Gain/Loss (Solar Heat Gain Coefficient)
- Ability to Perform Seasonal Energy Consumption Calculations
- Degree Day Formula Use

##### Building Automation and Control Systems

- Optimization and Safety for Various Energy-Related Systems
- PID Algorithms
- Basic Control Terminology
- Automation Systems Interoperability and IoT
- Current Technologies and Hardware and Energy Savings Strategies

##### Thermal Energy Storage Systems

- TES Terminology and Basic Designs
- Storage/Peak Shaving Strategies
- Storage Media Options
- Calculating Approximate Savings and Storage Size

#### Day 4

##### Boiler and Steam Systems

- Water Tube, Fire Tube, and Condensing Boilers
- Saturated and Superheated Steam
- Estimate Combustion Efficiency
- Calculate Heat Flows and Enthalpy Values using Steam Tables
- Energy Savings: Blowdown Heat Recovery, Flash Steam Utilization, Economizers, and Air Preheating

##### CHP Systems and Renewable Energy (Combined Heat and Power)

- Benefits of CHP Systems
- Calculating Basic Fuel Equation for CHP Systems
- Comparing CHP Fuel and Operating Costs vs. Utilities
- Comparing types of Renewable Energy and Storage Technologies

##### Industrial Systems

- Savings Estimates for Pumps, Compressed Air Systems and Waste Heat Recovery
- Pumps: Pump Curves and System Optimization Approaches
- Identifying Energy Waste Streams within Industrial Facilities

##### Energy Savings Performance Contracting and Measurement and Verification

- Financing/Performance Contracting (Cost of Delay vs. Financing Cost)
- 3rd Party Financing Options
- Performance Contracting Benefits vs. Risks
- EVO IPMVP Guidelines and Measurement Methods
- M&V Terminology, Check Ups, and Determining Best Approach for an ECM

#### Day 5

##### Open Q&A

##### Certification Exam