

# NEW CERTIFICATION PROGRAM AVAILABLE FOR DISTRIBUTED GENERATION AND COMBINED HEAT AND POWER PROFESSIONALS

*Barney L. Capehart, Ph.D., C.E.M.  
University of Florida*

*Carl E. Salas, P.E., C.E.M.  
Salas O'Brien Engineers, Inc.*

*Wayne C. Turner, Ph.D., P.E., C.E.M.  
Oklahoma State University*

*Steven A. Parker, P.E., C.E.M.  
Pacific Northwest National Laboratory*

## ABSTRACT

The Association of Energy Engineers recently created a new certification program for distributed generation and combined heat and power professionals. The purpose of this article is to discuss this new program, describe a new distributed generation course that will soon be offered, and explain the topics that will be covered by the certification examination. The article then outlines the certification procedure for professionals presently working in the area.

## INTRODUCTION

Exciting developments are occurring rapidly in the field of on-site electrical generation. Many megawatts of power generation are being installed at sites around the country. Often these installations include heat recovery through cogeneration or combined heat and power, but many recent installations have concentrated primarily on producing reliable or even redundant power at competitive prices. Renewable energy is also being considered more often and sometimes it is cost effective (wind generation, photovoltaics, wood-waste-fired plants, etc.) The trend is strong, the savings are often very large with great economic results, and the field is growing rapidly.

In recognition of this, the Association of Energy Engineers (AEE) is

offering a new certification program entitled the Distributed Generation Certified Professional (DGCP), and is teaching a course in support of the program. Course dates for the seminar and application forms for the DGCP certification examination are available on the AEE website, [www.aeecenter.org](http://www.aeecenter.org), under the Certification Program menu. This new certification program and course will be much broader in scope than the existing Certified Cogeneration Professional (CCP), and the new examination will include distributed generation concepts, combined heat and power systems, and renewable energy sources. The DGCP certification will replace the present CCP certification, and existing CCPs will be grandfathered into the new DGCP program.

The course will be taught by a team of two instructors: one is an engineering faculty member from a leading university, and the other a consultant experienced in the implementation of successful distributed generation and CHP systems. This teaching team should ensure good coverage of technical basics, as well as the necessary permitting, installation, implementation, and operating and maintenance skills. The course will be taught over three days. The morning of the fourth day the certification exam will be offered to professionals interested in the complete course/certification package.

## THE DGCP SEMINAR

This three-day seminar provides a comprehensive overview of the benefits of distributed generation (DG), common DG equipment technologies, combined heat and power systems, and case study applications. An understanding of permitting requirements, economic analysis, and potential implementation problems is vitally important, so these subjects will be emphasized by providing guidelines and checklists as appropriate. A thorough review of economic analysis procedures will also be given.

The last day of the course is substantially devoted to a presentation of case studies of actual DG and CHP systems in commercial, institutional, and manufacturing facilities. Seeing how the basic materials are used in actual situations and case studies will leave the attendee with both a solid understanding of DG/CHP and, more important, a practical "feel" for the benefits and challenges of applying DG/CHP to any site.

The seminar is intended for a wide range of professionals in the

field of distributed generation. To achieve this goal, the course will include general education and training on DG, CHP, and the various appropriate technologies, but will also prepare qualified DG practitioners for the AEE certification examination leading to the DGCP designation.

For attendees seeking a general background and training in the area of distributed generation, the course lectures will provide a significant amount of basic instruction. Presentations at the basic level include qualitative information—no formulas, calculations, or equations—that should be valuable for potential DG users at any industrial, commercial, institutional, or large residential facility. This material will also be very useful to utility representatives in commercial and industrial customer service, energy auditing and analysis and sales and marketing. DG policy makers at local, state, and national levels; and sales and marketing representative of DG equipment and fuel suppliers will also benefit from these presentations.

The course also includes intermediate and advanced levels of instruction for the DG professional seeking certification. Quantitative information involving the use of detailed formulas, calculations, and equations will be presented. Achieving an understanding of this material will require that the attendees have some skill in basic arithmetic, algebra and calculator operations, as well as general problem solving. A detailed course outline is included in Appendix 1.

## DGCP CERTIFICATION REQUIREMENTS AND EXAMINATION

### **The Application Process**

Interested professionals must fill out an application form that is available from AEE by mail or by downloading it from the AEE website at [www.aeecenter.org](http://www.aeecenter.org). The application is a short, two page form and is easy and quick to fill out. Information must be provided to substantiate experience to show that the candidate meets the eligibility requirements to become a DGCP.

### **Eligibility for DGCP Certification**

1. Current Cogeneration Certified Professionals (CCPs) will be grandfathered in as DGCPs.

2. For all others, the candidate must have:
- A four-year degree from an accredited university or college in science, engineering, architecture, business, law, finance, or related field, or be a registered Professional Engineer (P.E.) or Registered Architect (R.A.). In addition, the applicant must have at least three years of experience in cogeneration or distributed generation.
- or
- A two-year technical degree or a four-year non-technical degree, with five years experience in cogeneration or distributed generation.
- or
- Ten years of experience in cogeneration or distributed generation.
- or
- The current status of Certified Energy Manager (CEM<sup>®</sup>).

In addition, the candidate must take and pass the DGCP Certification Examination.

### **The DGCP Examination**

The DGCP examination is a four-hour, open book examination. Attendees whose goal is to become certified as a DGCP must be able to perform detailed technical and economic calculations and analyses on the intermediate and advanced DG concepts presented in the seminar. The DGCP certification examination is 50% qualitative (meaning True/False or multiple choice with no equations or calculations required), and 50% quantitative, with those problems ranging from simple one-step equation solutions to questions requiring multiple equations and several steps.

Qualitative questions on the DGCP examination will have a weight of 10 points per question, and simple one-step quantitative questions will have a weight of 15 points per question. There will also be a section on the examination containing 10 questions that are longer and more involved. These questions have a weight of 20 points per question. There will be a total of 80 questions on the examination, of which 50 are worth 10 points each, 20 questions worth 15 points each and 10 questions worth 20 points each. The maximum score on the exam is 1000 points, and the passing requirement is 70% or 700 points.

## THE DGCP CERTIFICATION BOARD

The administration of the DGCP Certification Program is accomplished through the efforts of a DGCP Certification Board, consisting of eight members, who set the DGCP operating policy, and who also review and approve applications from professionals interested in becoming DGCPs.

The current members of the DGCP Board are:

Dr. Barney L. Capehart, CEM Chairman University of Florida	Mr. Bernard Kolanowski Kolanowski & Associates
Mr. Carl E. Salas, PE, CEM Salas O'Brien Engineers, Inc.	Mr. Stephen Stone DSM Engineering Associates
Dr. Wayne C. Turner, PE, CEM Oklahoma State University	Mr. Kermit Harmon Harmon Technologies
Mr. Steven Parker, PE, CEM Pacific Northwest National Laboratory	Mr. Al Thumann, Ex Officio Association of Energy Engineers

## PREPARATION FOR THE SEMINAR AND EXAM

The primary reference for the seminar and the DGCP examination is *Combined Heating, Cooling and Power Handbook: Technologies and Applications*, by Neil Petchers, Fairmont Press, 2003 [Petchers]. There are two secondary references. One is the *Guide to Energy Management, Fourth Edition*, by Barney L. Capehart, Wayne C. Turner and William J Kennedy, Fairmont Press, 2003 [Capehart]. The other secondary reference is the *Energy Management Handbook, 4th Edition*, edited by Wayne C. Turner, Fairmont Press, 2001 [Turner]. All three books are available from The Fairmont Press, 700 Indian Trail, Lilburn, GA, 30048 ([www.FairmontPress.org](http://www.FairmontPress.org)).

For those attendees seeking general education and training in the area of distributed generation, the only background needed for the seminar is a knowledge of energy and electric rates, and some knowledge of the operation of the natural gas and electric power industry. Specific background knowledge is required in the areas of electric rates, gas rates, and utility bill analysis. For those needing additional work in these areas,

there are several sections of the three reference books that will provide the necessary information and background. These sections are Chapters 19, 20, 21 and 22 of Petchers; Chapter 3 of Capehart, and Chapter 4 of Turner. Any CEM (AEE Certified Energy Manager) should already have this general background.

After the basic skills and information have been covered in each section, quantitative information involving the use of detailed formulas, calculations, and equations will be presented. This material will require that the attendees have reasonable skills in basic arithmetic, algebra and calculator operations, as well as general problem solving. Any recent CEM should have this necessary level of quantitative skill. For those attendees needing a review or additional development of their skills in using the calculator, working with algebraic rules for equations and calculations, and general problem solving skills, there is an AEE On-Line Seminar available that is tailored to helping in this basic background area. The seminar is called Introduction to Energy Management: Preparation for the CEM seminars ([www.aeecenter.org](http://www.aeecenter.org); look under On-Line Seminars). Qualified professionals whose goal is to become certified as a DGCP must be able to perform detailed technical and economic calculations and analyses on the intermediate and advanced DG concepts covered in the course.

Although the CEM credential has been discussed several times so far in terms of background preparation, the CEM is not a requirement for this seminar or for becoming a Distributed Generation Certified Professional. However, the authors of this article are all CEMs, and strongly recommend that any professional active in the general energy or energy management area consider becoming a CEM if they are not one presently.

## CONCLUSION

DG is one of the most exciting technologies of our time and has great potential for the future. The economic savings, the environmental benefits and the stability of power all combine to make this field an extremely attractive one for energy professionals. The prospect of obtaining certification in this area will offer many new opportunities for professional advancement.

For those wanting to become certified under this new DGCP program, additional information and application forms are available from

the Association of Energy Engineers at their website [www.aeecenter.org](http://www.aeecenter.org). Dates of the upcoming DGCP courses are also listed on that website.

## APPENDIX 1

### COURSE OUTLINE

#### **The Theory and Practice of Distributed Generation and On-site Combined Heat and Power.**

This comprehensive three-day course will cover the technical, economic, and regulatory aspects of on-site generation systems, including distributed generation concepts, combined heat and power systems, and renewable energy sources. It is designed to provide attendees with the knowledge and skills they need to technically analyze, economically evaluate, select, install, deal with permitting requirements, and operate all types of on-site generation systems. The third day of the seminar will be substantially devoted to case studies of actual distributed generation and combined heat and power systems.

### SEMINAR OUTLINE

#### **Day 1**

- I. Introduction to Distributed Generation (DG) and Combined Heat and Power (CHP)**
  - Definitions of DG and CHP
  - Cogeneration Systems
  - Types of DG and CHP Systems
  - Benefits of DG and CHP Systems
  - DG and CHP Technologies
  - Regulatory Issues in DG and CHP Systems
  - Barriers to Implementation of DG and CHP Systems
  - Information Resources for DG and CHP Systems
  
- II. Distributed Generation and CHP Technologies**
  - Reciprocating Engines
    - Spark ignited
    - Self ignited
  - Combustion Gas Turbines
  - Microturbines
  - Steam Turbines
  - Fuel Cells
  - Solar Photovoltaic Cells
  - Wind Energy Conversion Systems
  - Energy Storage Systems

Electric Generators

**III. Energy and Thermal Basics of DG and CHP Technologies**

Energy, Heat and Work

First and Second Laws of Thermodynamics

Power Cycles

Simple, Topping, Bottoming, Combined, Cogeneration

Carnot Cycle and Carnot Efficiency

Need for Power and Heat

Prime Movers and Simple Cycles

Otto, Diesel, Rankine, and Brayton Cycles

Properties of Steam

Enthalpy and Entropy

Steam Turbine Expansion

Mollier Chart Analysis

**Day 2**

**IV. Power Cycle Performance Measures for DG and CHP Technologies**

Power Cycle Performance Measures

Thermal Efficiency

Higher Heating Value of Fuel

Lower Heating Value of Fuel

Heat Rate

Fuel Rate

Fuel Credit and Fuel Credit Value

Net Fuel Rate

Energy Chargeable to Power

Fuel Chargeable to Power

Cost Chargeable to Power

Relationship of ECP, FCP, and CCP

Total and Life Cycle CCP

Examples

**V. Economic and Life Cycle Cost Analysis for DG and CHP Systems**

Simple Payback Period

Life Cycle Costing

Time Value of Money

Present Value and Present Worth

Net Present Value

P, A, I, N parameters

Internal Rate of Return

Life Cycle Cost

Savings to Investment Ratio

After Tax Cash Flow

Point of Use Costs

- VI. PURPA and FERC Rules for QFs and SPPs**
  - Public Utilities Regulatory Policy Act (PURPA)
  - Federal Energy Regulatory Commission (FERC)
  - QFs—Qualifying Facilities
  - SPPs—Small Power Producers
  - Avoided Cost
  - Ownership Standard
  - Operating Standard
  - Efficiency Standard
  - Topping Cycles and Bottoming Cycles
  
- VII. Summary and Applications of DG and CHP Technologies**
  - DG and CHP System Operating Characteristics
  - Characteristics of DG and CHP Technologies
  - Comparison of DG and CHP Technologies
  - Selection of DG and CHP Technologies
  - Purchase and Operating Cost Data for DG and CHP Systems
  - Generic Case Study

**Day 3**

- VIII. Regulatory and Permitting Systems Issues for DG and CHP Systems**
  - Utility Interface Issues
  - Utility Interconnections
  - IEEE 929-2000 and UL 1741
  - IEEE 1547
  - Net Metering
  - Air Emission Permitting
  - The Permitting Process
  - Air Emission Limits
  - DG and CHP Project Management
  
- IX. Analyzing Facility Energy Needs**
  - Selection of DG and CHP Technologies
  - Screening of Technologies
  - Addressing Potential Barriers
  - Acquiring DG and CHP Resources
  
- X. Distributed Generation and CHP Case Studies**
  - Basic DG and CHP Systems Analysis
  - Generic and Advanced Case Studies
    - Current & Future Economics
    - Load consistency (thermal, electrical, future...)
    - Physical constraints
    - Systems constraints
    - Utility constraints (interconnection)
    - Permit Constraints
    - Air quality

Local Jurisdiction  
Staffing or infrastructure constraints  
Break out Session

**Day 4 Morning**  
**The DGCP Certification Examination**

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**Bibliography**

Combined Heating, Cooling and Power Handbook: Technologies and Applications, Neil Petchers, Fairmont Press, 2003.  
Guide to Energy Management, Fourth Edition, Barney L. Capehart, Wayne C. Turner and William J Kennedy, Fairmont Press, 2003.  
Energy Management Handbook, 4th Edition, edited by Wayne C. Turner, Fairmont Press, 2001.

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**ABOUT THE AUTHORS**

**Barney L. Capehart, Ph.D., CEM**, is a Professor Emeritus at the University of Florida College of Engineering, and is a member of the AEE Hall of Fame. Barney is the lead author of *Guide to Energy Management* from Fairmont Press, and is a Fellow of IEEE, IIE and AAAS. In his spare time, he enjoys foreign travel, square and round dancing, and ham radio (K4AQP). Barney can be reached at Capehart@ise.ufl.edu.

**Wayne C. Turner, Ph.D., P.E., C.E.M.** is a Regents Professor of Industrial Engineering and Management at Oklahoma State University. Dr. Turner has broad experience in energy management and has authored five textbooks and numerous articles. He is editor-in-chief of AEE's journals *Energy Engineering* and *Strategic Planning for Energy and The Environment*. He is an avid fly fisherman and is willing to fly fish anywhere anytime. His e-mail address is wturner@okstate.edu.

**Carl E. Salas, P.E., C.E.M.**, is a principal in the firm of Salas O'Brien Engineers, Inc. in San Jose, California. He received his B.S. in mechanical engineering from Virginia Tech, studied engineering management at the University of Santa Clara, and is a registered professional mechanical engineer in five states. He devotes his spare time to his two children and their school, and to the San Jose Rotary Club. He can be reached by e-mail at: carl@salasobrien.com.

**Steven A. Parker, P.E., C.E.M.** is a senior research engineer at the Pacific Northwest National Laboratory (PNNL) where he manages several energy-efficiency activities for the U.S. Army and the U.S. Department of Energy. In addition, Steven is editor-in-chief of this journal. When not touring the Pacific Northwest's wine country, he enjoys traveling—either to the mountains for downhill skiing or to the tropics to SCUBA dive the depths. Steven may be contacted at the Pacific Northwest National Laboratory at steven.parker@pnl.gov.