

COGENERATION: CONSIDERATIONS, ADVANTAGES, DISADVANTAGES, AND ECONOMICS

July 27, 2017
Royal Sonesta Houston
Houston, TX



EUCI is authorized
by IACET to offer 0.8
CEUs for the course

OVERVIEW

This course is intended for those that would like to gain familiarity with the various issues and challenges that are faced when considering the possibility of installing a cogeneration facility. Cogeneration or combined heat and power (CHP) is the simultaneous production of electricity and heat from a single fuel source. Even though the heat and power are fueled from a single source cogeneration is not a single technology, but is an integrated energy system. It is the complexity of the system and the number of different types of entities with very different circumstances that can benefit from the choice to cogenerate that brings to light the many considerations, advantages, and possible disadvantages of installing cogeneration. The number of options for any plant are many and the methodology is somewhat confusing, this is part of what we hope to break down through out this course. These issues as well as economic considerations, efficiency, permitting and evaluations will be covered in the course.

LEARNING OUTCOMES

- Outline cogeneration case studies
- Explain cogeneration and its fundamentals
- Review thermal load and electrical load balances
- Discuss the advantages and disadvantages of cogeneration plants
- Determine combustion, boiler and cycle efficiencies
- Contrast the types of cogeneration plants
- Examine plant considerations and the economics of building a cogeneration plant
- Identify permitting and environmental issues

WHO SHOULD ATTEND

- Those who want to better understand cogeneration options for their facilities
- New employees that are involved with cogeneration plants
- Regulators, communications staff, and others who need a better understanding of cogeneration options and considerations
- Corporate accountants who desire to better understand cogeneration systems and potential cost factors
- Purchasing personnel that want to learn more about the equipment that they purchase fit into a cogeneration plant
- Sales personnel that might want to better understand cogeneration systems to address their customer's needs.



“Excellent primer on the critical matters impacting cogeneration projects. These are “must know” details.”

Head- Generation Special Projects, Jamaica Public Service Co.

AGENDA

THURSDAY, JULY 27, 2017

8:00 – 8:30 am **Registration and Continental Breakfast**

8:30 am – 5:00 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

What is Cogeneration?

- Generation of heat and generation of power
- Not a combined cycle
- Examples of cogeneration
- First Law of Thermodynamics – covers generation of heat
- Second Law of Thermodynamics – covers generation of power
- Cogeneration combines these two processes

Advantages and Disadvantages of Cogeneration

- Cogeneration is more efficient than generating each separately
- Reduces dependence on the grid
- Allows for “islanding”
- Provides for power when the grid is down
- Cogeneration is more complex
- Requires a balance between thermal load and electrical load
- Implies the need for more redundancy to “island”
- Is not that much more efficient
- Can be costly

Efficiency

- What do we mean by efficiency?
 - o Combustion efficiency
 - o Boiler efficiency
 - o Cycle efficiency
 - o Gross and net plant heat rate
 - o Cogeneration efficiency
 - o Marginal heat rate
- Pitfalls
 - o HHV
 - o Mixing up first law and second law comparisons
 - o Example



“Carl is a rock star! Brilliant Man! The most intelligent S.M.E. (subject matter expert) in this area that I have ever met.”

Project Manager, Southern Company

AGENDA

THURSDAY, JULY 27, 2017 (CONTINUED)

Types of Cogeneration Plants

- Boiler with back pressure steam turbine
- Gas turbine with HRSG (with supplementary firing)
- CFB with external heat exchanger
- Trigeneration

Plant Considerations

- Steam load and its variations
- Electric load and its variations
- Reliability
- Back-up power
- Plant needs
 - o Manufacturing
 - o Chemical plant
 - o Refinery
 - o Hospital
 - o University
- Hypothetical plant

Economics

- Who owns the plant?
 - o Industrial (balance sheet financing)
 - o IPP (or 3rd party)
 - o Municipal
 - o Hospital
 - o University
- Cost of Money
- Plant size
- Critical requirements
- Self-generation vs Sell to the grid

Permitting and Environmental Issues

- New unit
- Retrofit
- Fuel switching
- Electric generating unit or industrial

Setting-Up an Evaluation

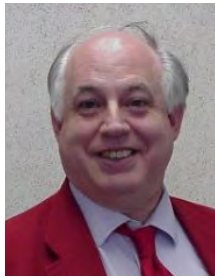
- Site conditions
- Requirements
- Feasibility
- Narrowing down the choices

Case Studies

- University
- Chemical plant
- Industrial park

Review

INSTRUCTOR



Carl R. Bozzuto

Honorary Member, The Council of Industrial Boiler Owners

Carl Bozzuto has nearly 50 years of experience in combustion and boiler operations and research. He began his career as a research engineer, senior project engineer, manager, and director for Combustion Engineering Inc. Carl was named vice president of process technology for the company, where he was responsible for the development and commercialization of new boiler and power plant technologies, including advanced cycles, ultra-supercritical boilers, alternative working fluids, fluid bed boilers, plant integration, and other plant component technology. Serving recently as vice president of technology for the Power Environment Sector at Alstom Power Inc., he was responsible for the development and implementation of new technology for boiler and environmental products on a worldwide basis. Bozzuto holds 18 U.S. patents and membership in the American Institute of Chemical Engineers (AIChE), the Combustion Institute, the Source Evaluation Society, and the American Society of Mechanical Engineers (ASME). He has authored more than 30 published technical papers and was editor-in-chief of the textbook Clean Combustion Technologies, published by Alstom Power in 2009. Bozzuto has earned Bachelor of Science and Master of Science degrees in chemical engineering from the Massachusetts Institute of Technology and a Master of Science degree in management from the Hartford Graduate Center (RPI).

INSTRUCTIONAL METHODS

This program will use PowerPoint Presentations, group discussions, as well as active participation.

REQUIREMENTS FOR SUCCESSFUL COMPLETION

Participants must sign in/out each day and be in attendance for the entirety of the course to be eligible for continuing education credit.

EVENT LOCATION

A room block has been reserved at the Royal Sonesta Houston, 2222 West Loop S, Houston, TX 77027, for the nights of July 23- 26, 2017. Room rates are \$139 plus applicable tax. Call **1-713-627-7600** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is June 23, 2017 but as there are a limited number of rooms available at this rate, the room block may close sooner. ***Please make your reservations early.***

IACET CREDITS



EUCI has been accredited as an Authorized Provider by the International Association for Continuing Education and Training (IACET). In obtaining this accreditation, EUCI has demonstrated that it complies with the ANSI/IACET Standard which is recognized internationally as a standard of good practice. As a result of their Authorized Provider status, EUCI is authorized to offer IACET CEUs for its programs that qualify under the ANSI/IACET Standard.

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Please make checks payable to: "PMA"



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PLEASE SELECT

- SPECIAL RATE FOR 3 COURSES: COMBINED CYCLE POWER PLANT FUNDAMENTALS, HEAT RECOVERY STEAM GENERATOR (HRSG) FUNDAMENTALS COURSES AND COGENERATION: CONSIDERATIONS, ADVANTAGES, DISADVANTAGES, AND ECONOMICS:** JULY 24-27, 2017: US \$2695
EARLY BIRD on or before JULY 7, 2017: US \$2495
- COGENERATION: CONSIDERATIONS, ADVANTAGES, DISADVANTAGES, AND ECONOMICS COURSE ONLY**
JULY 27, 2017: US \$995
EARLY BIRD on or before JULY 7, 2017: US \$895

How did you hear about this event? (direct e-mail, colleague, speaker(s), etc.)

Print Name

Job Title

Company

What name do you prefer on your name badge?

Address

City

State/Province

Zip/Postal Code

Country

Phone

Email

List any dietary or accessibility needs here

CREDIT CARD INFORMATION

Name on Card

Billing Address

Account Number

Billing City

Billing State

Exp. Date

Security Code (last 3 digits on the back of Visa and MC or 4 digits on front of AmEx)

Billing Zip Code/Postal Code

OR Enclosed is a check for \$ _____ to cover _____ registrations.

Substitutions & Cancellations

Your registration may be transferred to a member of your organization up to 24 hours in advance of the event. Cancellations must be received on or before June 23, 2017 in order to be refunded and will be subject to a US \$195.00 processing fee per registrant. No refunds will be made after this date. Cancellations received after this date will create a credit of the tuition (less processing fee) good toward any other EUCL event. This credit will be good for six months from the cancellation date. In the event of non-attendance, all registration fees will be forfeited. In case of course cancellation, EUCL's liability is limited to refund of the event registration fee only. For more information regarding administrative policies, such as complaints and refunds, please contact our offices at (201) 871-0474.