

# HEAT RECOVERY STEAM GENERATOR (HRSG) FUNDAMENTALS

July 26, 2017  
Royal Sonesta Houston  
Houston, TX



EUCI is authorized  
by IACET to offer 0.7  
CEUs for the course

## OVERVIEW

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This course on HRSG Fundamentals is intended for those that want to know a little bit more about the HRSG and its use in combined cycle and cogeneration plants. Topics to be covered include types of HRSGs, heat exchangers, boiler circulation systems, components, heat management, controls, water chemistry, emission controls, associated equipment, and fabrication/construction. Key features include heat transfer, surface arrangements, design/operating considerations, and integration with combined cycles and cogeneration equipment. Steam conditions will also be discussed.

## LEARNING OUTCOMES

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- Explain heat transfer and flow within HRSG
- Describe the function of the economizer, evaporator, superheater, reheater, and steam drum components
- Discuss saturated and superheated steam fundamentals, temperature and superheater controls
- Identify purpose of drains, vents, and safety valves
- Outline HRSG controls and protective trips
- Review HRSG construction

## WHO SHOULD ATTEND

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- New employees who work at or deal with heat recovery steam generators
- Engineering Staff
- Project Management
- Administrative staff who need a better understanding of HRSGs



***“Excellent opportunity for someone who knows very little about HRSGs to gain a great end to end overview.”***

Head-Generation Special Project, Jamaica Public Service Co.



***“Available to discuss any specific questions. Also Carl was able to relate many of his points to specific applications he personally experienced.”***

VP, Coastal Technologies

# AGENDA

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WEDNESDAY, JULY 26, 2017

**8:00 – 8:30 am**

**Registration and Continental Breakfast**

**8:30 - 9:00 am**

**What is an HRSG?**

- Recovers Heat Energy from Another Stream or Process
- Waste Heat Boiler
- Examples
- Electric Generation vs. Cogeneration

**9:00 – 9:30 am**

**Heat Exchangers**

- Basic Flows
- Heat Transfer
- Types of Heat Exchangers
- Key Parameters

**9:30 – 10:00 am**

**Types of HRSG's**

- Horizontal
- Vertical
- Supports
- Surface Arrangements
- Access

**10:00 – 10:30 am**

**Networking Break**

**10:30 – 11:00 am**

**Circulation Systems**

- Natural Circulation
- Forced Circulation
- Steam Drums
- Headers
- Saturated and Superheated Steam



***“This course is a good overview for any engineer new to this topic.”***

Mechanical Engineer, Express Integrated Technologies



***“This course alongside the Combined Cycle Fundamentals course will help new employees with little or no experience in the power generation field. This course helped me understand how the plant works outside my office.”***

Operation Support Specialist, Puget Sound Energy

# AGENDA

WEDNESDAY, JULY 26, 2017 (CONTINUED)

- |                            |   |
|----------------------------|---|
| <b>11:00 – 11:30 am</b>    | <b>HRSG Components</b> <ul style="list-style-type: none"><li>• Economizer</li><li>• Evaporator</li><li>• Superheater</li><li>• Reheater</li><li>• Steam Drum</li><li>• Headers</li><li>• Entrance Duct</li><li>• Walls</li><li>• Linings</li><li>• Support Steel</li></ul>  |
| <b>11:30 am – 12:00 pm</b> | <b>Heat Management</b> <ul style="list-style-type: none"><li>• High, Intermediate, and Low Pressure</li><li>• Gas Temperature Management</li><li>• Integration With The Steam Cycle</li><li>• Supplementary Firing</li><li>• Heat and Mass Balances</li><li>• Gas Path</li><li>• Water Path</li><li>• Cooling Tower</li></ul> |
| <b>12:00 – 1:00 pm</b>     | <b>Group Luncheon</b>   |
| <b>1:00 – 1:30 pm</b>      | <b>Integration with the Combined Cycle</b> <ul style="list-style-type: none"><li>• Hot Gas Source</li><li>• Steam Turbine</li><li>• Condenser</li><li>• Cooling Tower</li><li>• Feedwater Train</li></ul>   |
| <b>1:30 – 2:00 pm</b>      | <b>Water Chemistry</b> <ul style="list-style-type: none"><li>• Requirements</li><li>• Water Treatment</li><li>• Potential for Internal Corrosion</li></ul>  |
| <b>2:00 – 2:30 pm</b>      | <b>Emissions Control</b> <ul style="list-style-type: none"><li>• Source of Emissions</li><li>• SCR</li><li>• CO Catalyst</li></ul>  |
| <b>2:30 – 3:00 pm</b>      | <b>Networking Break</b>   |



*“Very informative.”*

Mechanical Engineer,  
Express Integrated Technologies



*“Great introductory course to HRSG for participants new to the industry.”*

Founder & COO, LoCap Energy



*“This EUCI course is a great entry-level exposure to HRSG fundamentals.”*

Quality Engineer, Hamon Deltak, Inc.

# AGENDA

WEDNESDAY, JULY 26, 2017 (CONTINUED)

3:00 – 3:30 pm

## Balance of Plant Equipment

- Pumps
- Valves
- Instrumentation
- Compressed Air

3:30 – 4:00 pm

## Controls

- Desuperheater
- Drum Level
- Water Chemistry
- Start Up
- Isolated Economizers
- Feedwater Storage
- Drain and Vent Systems
- Blowdown

4:00 – 4:30 pm

## Fabrications and Construction

- Materials
- Modules
- Harps
- C-Sections
- Supports
- Design Considerations
- Shipping
- Tube Restraints
- Casing Design

4:30 – 5:00 pm

## Review

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*“Carl Bozzuto is very informed about HRSG. This venue is one of the few such available to outsiders such as myself. EUCI has put together a great presentation. Very useful!”*

Sr. Piping Technologist/Project Manager, Stress Engineering Services, Inc.

“

*“The EUCI offered HRSG course was extremely helpful, covered all the components related to HRSG.”*

Senior Engineer, Duke Energy

# 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

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PowerPoint presentations and classroom discussion will be used in this course.

## REQUIREMENTS FOR SUCCESSFUL COMPLETION

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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

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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

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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.

**EUCI is authorized by IACET to offer 0.7 CEUs for the course**



*"I am new to the industry and I found this course to be a perfect introductory course."*

Technical Sales, Groome Industrial



*"The perfect course for beginners looking to learn the basics on HRSG."*

Civil Engineer, Intertechne

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
- BOTH COMBINED CYCLE POWER PLANT FUNDAMENTALS AND HEAT RECOVERY STEAM GENERATOR (HRSG) FUNDAMENTALS COURSES:** JULY 24-26, 2017: US \$1995  
EARLY BIRD on or before JULY 7, 2017: US \$1795
- HEAT RECOVERY STEAM GENERATOR (HRSG) FUNDAMENTALS COURSE ONLY:** JULY 26, 2017: US \$895  
EARLY BIRD on or before JULY 7, 2017: US \$795

**REGISTRATION**  
*to register [CLICK HERE](#) or*

**Call: 201 871 0474**  
**fax: 253 663 7224**  
**email: [register@pmaconference.com](mailto:register@pmaconference.com)**  
**web: <http://pmaconference.com/>**  
**Mail: POB 2303 Falls Church Va 22042**

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 EUCI 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, EUCI'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.