

RECIPROCATING ENGINES AND THE VALUE OF FLEXIBILITY

November 13-14, 2018

Courtyard by Marriott Denver Cherry Creek
Denver, CO



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OVERVIEW

The utility industry is undergoing a permanent change. Renewables have continued to become more and more competitive and are steering the power industry towards a cleaner more sustainable future. As a result, utilities are installing large amounts of solar and wind generation. Power systems that contain slow, inflexible, large generating assets are not prepared for such large amounts of renewable generation and are suffering the consequences. The need for flexible, sustainable, and reliable generation has never been more evident. Reciprocating engines are fast responding generating assets that are known for their low heat rates. Engines will enable the addition of renewables and allow dispatchers to utilize the savings of a high renewable portfolio. Governments and utilities are taking advantage of the low-cost renewables allowing for massive savings on fuel cost & power plant operation and maintenance.

Reciprocating Engines and the Value of Flexibility teaches utility resource planners and other generation professionals how to use reciprocating engines in a way that allows them to quickly respond to volatile conditions in order to ensure reliable service throughout the grid. They will become familiar with what goes into operating and maintaining this equipment and come away with tools to assess the case for using reciprocating engines.

LEARNING OUTCOMES

- Discuss resource planning for reciprocating engines
- Review increasing variability of intermittent resources
- Identify flexibility and engines' place in Regional Transmission Operators (RTOs)/Independent System Operators (ISOs)
- Review reciprocating engine case studies
- Examine the basics of reciprocating engines
- Assess technical components of reciprocating engines (e.g. Efficiencies in different environment, fuel flexibility, environmental, configurations, delivery, etc.)
- Clarify operation and maintenance of reciprocating engines
- Observe a reciprocating engine in action at a tour of Plains End 231 MW Wartsila (8950 Highway 93, Arvada, CO 80007)

WHO SHOULD ATTEND

- Utility Resource Planners
- Generation Professionals
- Consulting Firms for Utilities or Power Producers
- Engineering & Construction Firms
- Professionals interested in the Reciprocating Engines Business

AGENDA

TUESDAY, NOVEMBER 13, 2018

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|----------------------------|---|
| 8:30 – 9:00 am | Registration and Continental Breakfast |
| 9:00 – 9:15 am | Introduction/Welcome |
| 9:15 – 10:15 am | Increasing Variability of Intermittent Resources <ul style="list-style-type: none">• Increase of intermittent resources• Renewable forecasting and volatility• Impacts of volatility on system |
| 10:15 – 11:15 am | Flexibility in Regional Transmission Originations (RTOs)/ Independent System Operators (ISOs)/CAISO EIM <ul style="list-style-type: none">• System operator overview• Challenges of sustaining systems• Value and need of current flexible assets |
| 11:15 – 11:45 am | Networking Break |
| 11:45 am – 12:45 pm | Introduction to Reciprocating Engines <ul style="list-style-type: none">• Reciprocating engine overview• Engine types and applications |
| 12:45 – 1:45 pm | Group Luncheon |
| 1:45 – 3:00 pm | Resource Planning for Reciprocating Engines <ul style="list-style-type: none">• Resource planning overview• Proper techniques for modelling reciprocating engines & flexibility• Examples of how results can differ when incorrect techniques are used |
| 3:00 – 3:30pm | Networking and Refreshment Break |
| 3:30 – 4:45 pm | Reciprocating Engine Case Studies <ul style="list-style-type: none">• Examples of reciprocating engine applications• Renewable case studies in US |
| 4:45 pm | End of Day One |

AGENDA

WEDNESDAY, NOVEMBER 14, 2018

- 8:30 – 9:00 am** **Continental Breakfast**
- 9:00 – 9:30 am** **Review of Previous Day**
- 9:30 – 10:30 am** **Technical Review of Reciprocating Engines**
- Efficiencies in different environment
 - Fuel flexibility
 - Environmental
 - Configurations
 - Delivery
- 10:30 – 11:00 am** **Networking Break**
- 11:00 am – 12:00 pm** **Operations and Maintenance of Reciprocating Engines**
- Day to day operation
 - Maintenance overview
- 12:00 – 1:00 pm** **Depart for Plains End Plant Tour**
Lunch will be provided for tour participants
- 1:00 – 3:00 pm** **Tour of Plains End 231 MW Wartsila**
8950 Highway 93, Arvada, CO 80007
Traditionally, Xcel Energy in Colorado was a stalwart provider of coal and gas-fired electricity. With the increasing penetration of renewable energy, Xcel required more flexibility to manage this intermittent resource. Plains End 1 (20 x Wärtsilä 18V34SG) and shortly after Plains End 2 (14 x Wärtsilä 20V34SG) were built just outside of Denver, Colorado to help manage this challenge. With unlimited starts and zero start costs, the plant provides roughly 230MW of power to help Xcel optimize its portfolio whenever it is needed. In recent years, this plant has also become Xcel's NERC compliant black start facility. Participants will see, hear, and feel how a reciprocating engine plant is laid
- 4:00 pm** **Return to Hotel, Course Adjournment**

COURSE INSTRUCTORS



Tony Delacluyse

Vice President, Power Costs, Inc.

Anthony “Tony” Delacluyse has spent over 34 years in the power industry. His experience includes power plant operations, origination, modeling, retail electric supply, starting an RTO, consulting and providing comprehensive electric industry software.

For the past 13 years Mr. Delacluyse has worked at Power Cost, Inc. (PC) working across North America with utilities and marketers in energy markets. In this role he has been exposed to many complex issues where he was responsible for providing operational and software solutions.

Prior to joining Power Costs, Inc. (PCI), Mr. Delacluyse worked at the Midwest ISO where he was responsible for the development, setup and testing of the initial MISO Market Settlement software, processes and procedures in compliance with the FERC-approved tariff. In this role, he managed all settlement software deliveries, testing and installations, and was responsible for all settlement interdependencies and business processes. Mr. Delacluyse was responsible for developing the business processes to ensure timely and accurate market settlements for 225 companies.

Before that, Mr. Delacluyse worked at several utilities either in origination, analysis or generation. In these roles he was responsible for minimizing outages and maximizing trading margins.

Mr. Delacluyse attended St. Ambrose University where he graduated with degrees in Business Administration and Economics along with a Master of Business Administration.



Gary Dorris, PhD

CEO and President, Ascend Analytics

Dr. Dorris has been a pioneer of innovative solutions for resource planning, portfolio management, and real-time asset optimization for over two decades. His software innovations serve as the analytic bridge between the physical and financial for enhanced portfolio management. His expertise are sought by industry leaders to deliver expert testimony in some of the most prominent risk management proceedings in the country, including serving as lead expert for Merrill Lynch in the prominent Enron proceedings.

Dr. Dorris has founded and organically grown Ascend Analytics over the last decade to be a leading provider of quantitative software solutions for generation operations, portfolio management, and resource planning. His analytic vision to integrate weather with physical and financial market dynamics has led to the development of over a dozen software applications used by over fifty energy companies, including 3 of the top 5 utilities in America. His company’s innovations have established industry standards for resource planning with uncertainty, hedging of energy supply portfolios, and predictive analytics for asset optimization.

Dr. Dorris holds a Ph.D. in applied economics and finance from Cornell University a BS in mechanical engineering and a BA in economics with Magna Cum Laude distinction, also from Cornell University.

COURSE INSTRUCTORS



Joseph Ferrari

General Manager, Utility Market Development, Wärtsilä

Joseph Ferrari is an engineer and scientist with masters degrees in aerospace engineering and natural resource science. He has authored numerous articles on topics ranging from design of combined cycles, emission control systems, integrated resource planning, the impact of coal retirement and enabling renewables using flexible generation. Mr. Ferrari worked at the University of Maryland for 5 years as a research scientist; 5 years at Wärtsilä North America, Inc. as a sales engineer for installation of over 1 BUSD in power plant projects in North and Central America; 5 years as the Market Development Analyst for Wärtsilä in the Americas, 2 years as Business Development Manager, and most recently has assumed the role of General Manager, Utility Market Development. His responsibilities include strategic market development, asset evaluations and portfolio planning for applications in the US and Latin America. Central to his work in the energy industry is a search for ways to optimize energy systems in light of ever expanding renewable penetration.



Phil Rutkowski

Business Development Manager, Wärtsilä

Mr. Rutkowski, Business Development Manager, is responsible for developing, managing, and closing Wärtsilä Energy Solutions opportunities throughout the Rocky Mountains in the USA. Since joining Wärtsilä in late 2015, he has successfully developed relationships with all the utilities in his assigned territory with the first contract signature happening in 2017.

Before joining Wärtsilä, Mr. Rutkowski worked in various sales and business development roles for both a steam turbine and wind turbine OEM. Mr. Rutkowski holds a MBA from the University of Michigan, and a Bachelor's of Science degree in Economics from the United States Military Academy at West Point.



Chris Whitney

Manager, Sales Support, Wärtsilä

Chris is a Mechanical Engineer who has worked for Wartsila for 30 years, first as a Project Manager for Power Plants, and is currently the Manager of Sales Support for Wartsila, located in Annapolis, Maryland. He worked initially for Schlumberger Offshore Services as a Field Engineer in the Gulf of Mexico and following that as the Chief Engineer of a small Independent Oil Company based in Lafayette, Louisiana. His current responsibilities include preparation of the technical specifications, performance data, and cost estimates for new offers produced by Wartsila for gas fired, and diesel and heavy fuel fired reciprocating engine plants. In addition, during his tenure at Wartsila he sold the first Wartsila power plant operating on crude oil, and the first Wartsila power plant operating on LPG fuel.

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.

INSTRUCTIONAL METHODS

Power Point presentations, case studies, and open discussion will be used.

EVENT LOCATION

A room block has been reserved at the Courtyard by Marriott Denver Cherry Creek, 1475 S Colorado Blvd, Denver, CO 80222, for the nights of November 11-13, 2018. Room rates are US \$119, plus applicable tax. Call **1-303-262-8792** for reservations and mention the EUCI event to get the group rate. The cutoff date to receive the group rate is October 22, 2018 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.

EUCI is authorized by IACET to offer 1.0 CEUs for the course.

REGISTER 3, SEND THE 4TH FREE

Any organization wishing to send multiple attendees to this course may send 1 FREE for every 3 delegates registered. Please note that all registrations must be made at the same time to qualify.



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PLEASE SELECT

- RECIPROCATING ENGINES AND THE VALUE OF FLEXIBILITY COURSE**
 NOVEMBER 13-14, 2018: US \$1395
 EARLY BIRD on or before OCTOBER 26, 2018: US \$1195

- YES I WOULD LIKE TO ATTEND THE TOUR OF PLAINS END 231 MW WARTSILA: US \$50**

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 October 12, 2018 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