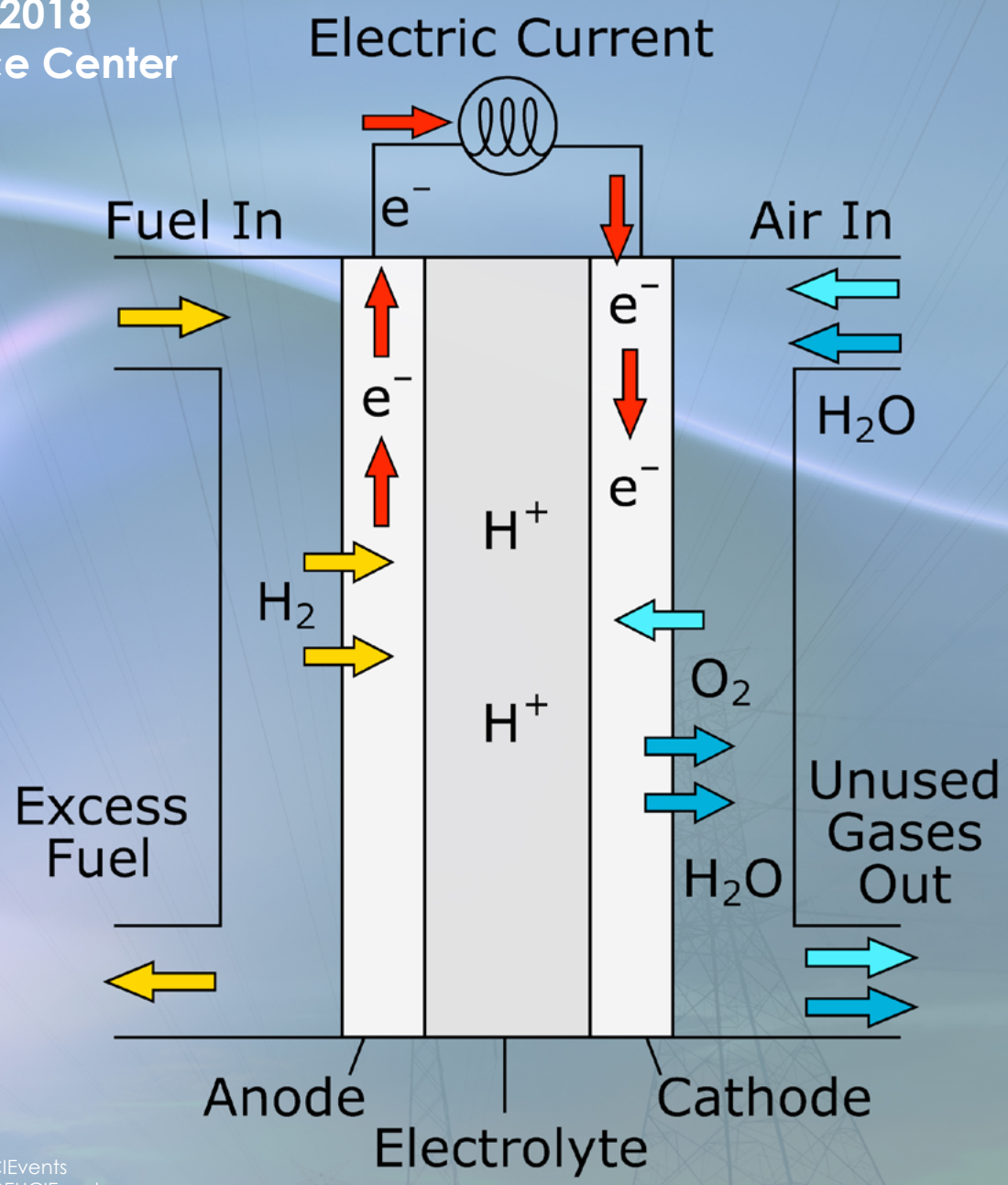
EUCI COURSE

FUEL CELLS FOR ELECTRIC UTILITIES

November 7-8, 2018
EUCI Conference Center
Denver, CO



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EUCI is authorized by IACET to offer 1.1 CEUs for the course

OVERVIEW

Fuel cells are positioned to become a major component of the electric utilities sector's generation mix because of the reduced emissions, storage opportunities and reliability potential. The Fuel Cells for Electric Utilities Course will overview baseload fuel cells, alternative uses for fuel cells and show how fuel cells are impacting the electric utilities industry. Instructors will review how the ITC for utility-scale fuel cells as the reinstatement of the investment tax credit for fuel cells levels the playing field between fuel cells and wind and solar. In this course, attendees will gain knowledge of fuel cell basics, how to create a business case for fuel cell programs, and network with other industry leaders who are looking to create or expand fuel cell programs within their organizations.

The Basics: Fuel cells convert hydrogen into electricity. Fuel cells have been around for a long time, but they have not been a major focus of attention in the electric utility sector in recent years. Rather, solar, wind, and storage have been at the forefront.

Fuel cells improve base load. Depending on the state, fuel cells can be classified as renewables. Unlike intermittent renewables, fuel cells can have a 95 percent availability (capacity) factor. Compare that to wind power (30 percent) and solar power (15 percent) and you can see what fuel cells can bring to the table. Fuel cells use a chemical process to convert hydrogen into electricity, not a combustion process. Fuel cells can displace fossil-fueled resources that would otherwise have resulted in substantial carbon and NOx emissions.

Fuel cells can accommodate:

- Distributed generation that increases grid resiliency and reliability
- Fuel cells can be dispatched by the system operator. Utility-scale fuel cell systems (e.g., 15 to 50 MW systems) can be comprised of multiple two to four MW fuel cells, each of which can be separately dispatched (load following) by the system operator to adjust to changing system demand
- Microgrids supported by fuel cells that can power hospitals, colleges, and neighborhoods when the power grid is down.
- The pilot project in Alabama is an "elephant in the room." The prospect of using carbonate fuel cells to concentrate natural gas or coal CO2 emissions in a way that supports economic carbon sequestration while also generating electricity, would be a "home run" application of fuel cells
- Emissions reduction and de-carbonization. Fuel cells can displace fossil-fueled resources that currently provide 24/7 support for intermittent renewables. This will become more important as renewable performance standards move higher
- Fuel cell vehicles may have a "long haul" advantage relative to batteries, especially for large vehicles. Refueling a fuel cell vehicle might be similar to refueling a gasoline powered vehicle
- Long-duration energy storage fuel cells can support the increased penetration of intermittent renewables and may be an effective alternative to batteries

LEARNING OUTCOMES

- Summarize the history of fuel cells and how technological change and improved economics are moving fuel cells from a niche product to a mainstream generation resource
- Describe the key aspects of the electricity business and then explain how fuel cells would usefully fit in
- Determine why fuel cells are proven technology
- Review the research and pilot projects that are continuing to develop new applications using the technology
- Identify the benefits to large deployments of fuel cells that can be installed near distribution substations or integrated into the transmission grid such as: (1) reduced line losses and transmission congestion; (2) reduced O&M and fuel costs; and (3) avoided distribution and/or transmission system infrastructure investments
- Explain how utility-scale fuel cell systems can fit into existing utility resource procurement processes
- Demonstrate how, with careful siting, fuel cells can displace or at least delay the need for major transmission upgrades. On Long Island, NY, for example, the installation of 40 MW of fuel cell generating capacity would allow the utility to delay roughly $78 million of transmission upgrades in the Hamptons
- Describe how fuel cells can be used in urban areas where other resource alternatives would be impractical
- Evaluate the long-term future of hydrogen and fuel cells. Decarbonization of the economy and increased reliance on renewables may be achieved via the electrification of the economy, including transportation and heating

WHO SHOULD ATTEND

- Utility resource planning professionals
- Financial analysts interested in the renewables sector and the announced IPO by Bloom, the largest fuel cell company, which is currently privately held
- Bankers and infrastructure investors in the renewables sector
- Project developers in the renewables sector
- Businesses and consultants interested in microgrids, server farms, distributed generation resources, and "behind the meter" generation
- Professionals interested in the battery electric vehicle and fuel cell vehicle businesses
- Gas and coal power plant operators that are interested in carbon sequestration

AGENDA

WEDNESDAY, NOVEMBER 7, 2018

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

8:30 am – 5:00 pm **Course Timing**

12:00 – 1:00 pm **Group Luncheon**

Introducing Fuel Cell Technology to Utility Professionals
- New resource of choice for microgrids and data farms
- Economic viability of carbon sequestration
- Fuel cell vehicles
- Utility-scale fuel cells can complement reliance on intermittent resources such as solar and wind

Connecting Electricity Industry and Fuel Cells
- Generation, transmission, distribution, and retail sale
- Wholesale competition, RTOs/ISOs, retail competition
- Traditional states v. retail competition states
- Baseload, load following (cycling), speakers, and storage
- Comparison to solar and wind
- Comparison to coal and nuclear units
- Comparison to battery storage
- End of life cycles of some nuclear and coal units

Increasing the Market Share of Renewables
- Displacement of fossil fuels
- Solar that is curtailed could be stored, but there are limitations
- Renewable portfolio standards
- Renewable energy credits
- Resource procurement via RFPs and Auctions
- Selling into the market v. power purchase agreements
- Funding construction of utility-scale generation
- Equity and debt funding after COD (commercial operation) is achieved

Integrating Fuel Cells: Transmission and Distribution into the Grid
- Distributed resources
- Smart siting to reduce the need for new transmission lines and distribution infrastructure investment
- Microgrids
- Combined heat and power (CHP)
- Tri-generation: electricity, steam/hot water, and hydrogen
- Fuel cells and carbon sequestration

Exploring Additional Applications: The Potential for Fuel Cells
- Hospitals, schools, large institutions
- Microgrids
- Data centers
- Wastewater treatment
- Gas pipelines (using gas that would otherwise be lost during the pressure reduction process)
- Biogas
- Fuel cell vehicles
- Other

AGENDA

THURSDAY, NOVEMBER 8, 2018

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

8:30 am – 12:00 pm **Course Timing**

Tracking the Competitors: The Market for Utility-Scale Fuel Cells

- Bloom. Bloom has an IPO in progress
- Fuel Cell Energy (FCEL)
- Doosan
- Ballard, Plug Power, and others

Procuring Resources: RFPs, PPAs, and Market Competition

- Summarize the key considerations in PPAs
- Utility resource procurement would be described
- RFPs are often used to procure renewables, such as solar, wind, and fuel cells
- Power purchase agreements can be used to procure resources over a period of 20 or so years
- PPAs for solar and wind are quite different from PPAs for natural gas or other baseload resources. The differences in the PPAs would be a major topic of discussion

Reviewing Real Results: Utility-Scale Fuel Cell Case Studies

- Bridgeport, CT, five unit 14.9 MW fuel cell owned by Dominion Energy
- South Korea. 59 MW resource comprised of 21 fuel cell units, which is the world's largest fuel cell park
- Long Island Power Authority, planned fuel cell resources on three sites in Yaphank, LI, NY, which would defer the need for roughly $75 million of transmission infrastructure
- Connecticut DEEP resource procurement process. 60 MW of fuel cell resources have already been selected
- Toyota, Long Beach, CA. Tri-gen electricity, steam/hot water, and hydrogen production for fuel cell vehicles

COURSE INSTRUCTOR

Wayne P. Olson, CFA

Principal, Solutions Economics

Mr. Olson wrote a book entitled The *A to Z of Public Utility Regulation*, published by Fortnightly (Public Utilities Reports) in May 2015. This book is an introduction to the subject of public utility regulation, providing a sound first look into the public utility industry and its regulatory issues, including the restructuring of regulated industries to accommodate competition. Mr. Olson's articles have appeared in industry journals, such as *Public Utilities Fortnightly* and the *Electricity Journal*. The subjects of Mr. Olson's previous *Electricity Journal* articles include formula-based ratemaking, fuel adjustment mechanisms, the sharing of merger savings, secrecy/transparency in the regulatory process, efficient electric restructuring, branding and standards of conduct, incentive ratemaking, and the lessons of the New Institutional Economics, among others.

Mr. Olson received an M.A. in economics and a B.S. in business administration with majors in economics and accounting from the University of North Dakota. He is a Chartered Financial Analyst and passed the examinations to be a Certified Public Accountant.

Mr. Olson is a Principal at Solutions Economics (http://www.solutionseconomics.com), a consulting firm, with experience gained from over 100 projects in more than 30 countries. Before that, he was a Senior Consultant at National Economic Research Associates. Among other activities while at NERA, Wayne worked on electric restructuring issues. merger-related regulatory issues, fuel adjustment clause issues, and cost of capital and other ratemaking issues in both the United States and Canada., In addition, I co-wrote the Business Plan for the National Energy Regulator of South Africa on behalf of the South Africa Department of Minerals and Energy.

Charles Iannello

President, CSI Energy Consulting

Mr. Iannello has over twenty years of energy industry experience in both the public and private sectors. He has dedicated much of his career to advancing competitive electricity and natural gas markets. In 2018, he started CSI Energy Consulting and currently serves as President. CSI specializes in assisting clients with regulatory and legislative strategy, government relations, risk management, corporate compliance, and operational efficiency.

Charlie previously held the position of Vice President, U.S. Regulatory Affairs, for Just Energy Group, Inc. (NYSE & TSX: JE) and served as a corporate officer in all U.S. operating affiliates. Prior to joining Just Energy in 2007, he served as a Chief Policy Advisor in the Office of Chairman and Commissioners at the Illinois Commerce Commission. Charlie advised the Commission on power procurement, energy and water utility rate cases, wholesale and retail competition in the electric, natural gas, and telecommunications industries, and matters before the Federal Energy Regulatory Commission.

From 1998 to 2005, Charlie was a Senior Economist and Economic Analyst in the Policy Program of the Illinois Commerce Commission's Energy Division. As a Staff Economist at the ICC, he was an advocate for competitive energy markets and testified as an expert witness in support of open access for 3 million natural gas customers in Northern Illinois.

Charlie holds an M.S. in Economics from the University of Wyoming with fields in Environmental, Regulatory and Public Utility Economics. His Master's thesis, "Wholesale and Retail Competition in the Natural Gas Industry in Theory and In Practice: A Transaction Cost Analysis" made the case for advancing competitive gas markets at both the state and federal level. Charlie also holds a B.S. in Economics with a concentration in Finance from the State University of New York College at Buffalo.

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

EUCI Conference Center
4601 DTC Blvd., B-100
Denver, CO 80237

NEARBY HOTELS

Preferred Hotel
Hyatt Place Denver Tech Center
8300 E. Crescent Parkway, Greenwood Village, CO 80111 (0.9 miles away)
Call Central Reservations at **888-492-8847** and ask for the corporate rate of $159 under the **Group Code: EUCI.**
or visit **https://denvertechcenter.place.hyatt.com/en/hotel/home.html?corp_id=102338 for the corporate rate using the Group Code: EUCI**

Hyatt Regency Denver Tech Center
7800 E. Tufts Ave
Denver, CO 80237
Phone: 303-779-1234
0.3 miles away

Hilton Garden Inn Denver Tech Center
7675 E. Union Ave
Denver, CO 80237
Phone: 303-770-4200
0.6 miles away

Denver Marriott Tech Center
4900 S. Syracuse St
Denver, CO 80237
Phone: 303-779-1100
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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 1.1 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.

To Register, Click here, or

Mail Directly To:
PMA Conference Management
PO Box 2303
Falls Church VA 22042

register@pmaconference.com

Tel. 201 871 0474
Fax 253 776 7224

EVENT LOCATION

EUCI Conference Center
4601 DTC Blvd., B-100
Denver, CO 80237

See nearby hotels on page 7

◯ **FUEL CELLS FOR ELECTRIC UTILITIES COURSE**
NOVEMBER 7-8, 2018: US $1395
EARLY BIRD on or before OCTOBER 19, 2018: US $1195

ENERGIZE WEEKLY

EUCI's Energize Weekly e-mail newsletter compiles and reports on the latest news and trends in the energy industry. Newsletter recipients also receive a different, complimentary course presentation every week on a relevant industry topic. The presentations are selected from a massive library of more than 1,000 current presentations that EUCI has gathered during its 30 years organizing courses.

◯ **Sign me up for Energize Weekly**

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

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CREDIT CARD INFORMATION

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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 5, 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.
EUCI reserves the right to alter this program without prior notice.