

# **ASM Cleveland Chapter Symposium on Alternative Energy**

## **Presentations and Speakers**

### **1) Building an Advanced Energy Industry in Northeast Ohio:**

Significant global challenges are driving the need for substantially replacing the energy industry we now take for granted over the next few decades. A new multi-trillion advanced energy industry, based on new technologies, will inevitably emerge. Here in Northeast Ohio, we have a number of assets to capitalize upon in building the advanced energy industry of the future, and if we pursue this imperative with vigor, the advanced energy sector can represent a major engine for economic revitalization in our region.

Richard Stuebi is a Fellow for Energy and Environmental Advancement, The Cleveland Foundation, Founding Principal of NorTech's Advanced Energy Initiative, and Managing Director of Early Stage Partners. Richard has more than 20 years of experience as an executive, entrepreneur, and consultant in the energy industry, with most of the past decade focused on advanced energy technologies and business opportunities. Based in Cleveland, Richard has both civic and private sector responsibilities in catalyzing the region's advanced energy sector. Richard is a founding principal in NorTech's advanced energy initiative, where he is working on loan from The Cleveland Foundation, which he joined in March 2006 as the Fellow for Energy and Environmental Advancement. In these capacities, he works with a broad spectrum of public-sector and private interests to promote commercial activity in advanced energy in Northeast Ohio. Richard also spends a portion of his time as a managing director at Early Stage Partners, a Cleveland -based venture capital firm, where he leads the firm's activities to invest in promising ventures developing and commercializing advanced energy and environmental technologies. Prior to arriving in Cleveland, Richard founded NextWave Energy, a professional firm based in Denver helping client companies capitalize on new business opportunities involving innovative energy technologies including strategy and capital formation. Previously, he was a senior vice president at the global commodity trading firm Louis Dreyfus, a management consultant in the energy practice of McKinsey & Co., and an economic analyst at ICF Resources. Richard holds economics degrees from the Massachusetts Institute of Technology and Stanford University. A frequent public speaker, he also shares his perspectives on energy and environmental matters weekly at [www.cleantechblog.com](http://www.cleantechblog.com) and his own Cleveland Foundation blog.

### **2) NASA Capabilities Aligned with Advanced Energy Needs of Our World:**

Energy and the environment are paramount issues facing the nation. The development of sustainable, environmentally compatible forms of energy is perhaps the foremost technology challenge of the modern era, and one that the Obama-Biden team recognized and discussed at length during the presidential campaign. On several occasions, President Obama has cited the NASA Apollo Program of the 1960's when describing the magnitude of the effort needed to solve this problem.

NASA has a strong set of capabilities that are most relevant to the advanced energy and environment area as well as a heritage of producing and delivering technologies that made a major impact on our country after the energy crisis of the 1970's. NASA has developed and demonstrated extraordinary technologies over the last 30+ years that could greatly contribute to addressing the world's energy and global climate change challenges. These NASA capabilities range from basic research investigations through system demonstrations guided by systems engineering that could make a major impact on our world's energy crisis. NASA's unique knowledge and integrated perspective would prove invaluable in boosting efforts to achieve sustainable energy security. NASA also has significant capability in the

broad area of atmospheric science including airborne measurements as well as atmospheric modeling and assessment. This expertise will be invaluable in addressing the global climate change aspect of any advanced energy and the environment program. The talk will overview past NASA contributions to addressing the energy crisis of the 1970's as well as describe current Agency capabilities aligned with the world's advanced energy needs and describe how these capabilities could be employed to address the challenges we currently face.

Dr. Robert J. Shaw is the Chief of the Business Development and Partnership Office at the National Aeronautics and Space Administration's Glenn Research Center (GRC). His position entails responsibility for providing executive leadership for advocacy, planning, and execution of all Center strategic partnerships with other Government agencies, academia, and industry and for development of new business opportunities for GRC that are outside NASA product lines and emphasize the Center's research competencies.

As part of his role relative to strategic partnerships, he has served on leadership teams for the following interagency collaboration focused groups:

- Aircraft Icing Research Alliance (co chair person)
- Propulsion and Power Systems Alliance (chair person)
- Interagency Advanced Power Group

In 1970, Dr. Shaw joined NASA Glenn as an aerospace engineer and assumed increasing responsibilities working on subsonic and supersonic inlet technology projects as well as in aircraft icing efforts at Glenn. His prior management positions included managing the propulsion element of the High Speed Research Program, which resulted in major technology advancements in supersonic aircraft technology and the Ultra Efficient Engine Technology (UEET) Program. He served as Associate Director for Partnerships at GRC prior to assuming his current position.

Dr. Shaw has been a member of the air breathing propulsion and atmospheric environment technical subcommittees of the American Institute for Aeronautics and Astronautics. He is also past chairman of the AC-9C aircraft icing subcommittee of the Society for Automotive Engineers. Also, he served as a member of the DoD's IHPTET/VAATE Steering Committee.

In 1996, in recognition of his contributions to leadership in the High Speed Research Program, Dr. Shaw was awarded the prestigious NASA Exceptional Leadership Medal. Additionally, he received the NASA Exceptional Service Medal in 1990 and the Ohio State University College of Engineering Distinguished Alumnus award in 1993.

Dr. Shaw received his bachelor's, master's, and doctorate degrees in aeronautical-astronautical engineering from The Ohio State University.

### **3) Wind Energy:**

Over the past 30 years, wind energy has become one of the most successful renewable alternative energy sources in the world. It provides a great example of innovation in alternative energy and how technology is adopted into the marketplace. As successful as wind energy has become, new opportunities and challenges are emerging as systems increase in size and are introduced into new markets and operating environments. Cleveland and Ohio are positioned well to provide both enabling research and commercial product development. In addition to current and future wind turbine technologies and trends, the importance of business planning and public policy for emerging technologies will also be

discussed. The lessons learned from wind energy's success are fundamental to developing a portfolio of technology-based solutions to the challenge of sustainable energy.

Dr. Larry Viterna is a loaned executive to Case Western Reserve University from NASA. He serves as the Technical Director of the Great Lakes Energy Institute, leading the formation of technology development efforts in renewable energy and energy storage. Dr. Viterna has led Strategic Business Development at the NASA Glenn Research Center, a federal laboratory with a budget of over \$600M and a workforce of 2500. Previously he was assigned to NASA Deputy Administrator in Washington, DC, where he led the development of the implementation strategy for Agency-wide changes following the Space Shuttle Columbia Accident.

Dr Viterna was on the team that developed the world's first multi-megawatt wind turbines starting in 1979. He is the recipient of NASA's Blue Marble Award for aerodynamic models, now named for him, that are part of international design tools for wind turbines. He has also been recognized with NASA Glenn's highest Engineering Excellence award for his pioneering work in fuel efficient hybrid vehicles. He received his PhD in Engineering from the University of Michigan and has completed executive education in business administration at Stanford University, public policy at the Harvard Kennedy School of Government, and international management at the National University of Singapore.

#### **4) Solar Power:**

This session will review the direction of commercial terrestrial solar energy technology, exploring key industry trends and projecting the market's future. We will review market requirements and growth trends, describing mechanisms for regulatory support in the industry, explore key differences in geographic markets, and project how the market will need to mature to reach mainstream deployment. GreenField's technology will be described, comparing and contrasting it with other solutions in the market, and the Company's direction and plans will be reviewed.

Neil Sater is a founder and CEO of GreenField Solar Corp., a Northeast Ohio company that is commercializing its innovative StarGen™ concentrated PV technology. Neil contributed on a part-time basis to the development of GreenField's PhotoVolt™ cell for years, working with his father Bernard, the inventor of this unique high intensity concentrated PV cell. Prior to dedicating full time to solar energy in 2007, Neil worked for Intel Corporation, where he managed America's Comms, Media, and Software business development teams, driving commercial success of the Company's new products and major growth initiatives such as WiMAX, Centrino and Atom Processors. Earlier in his career, he was an engineer and engineering manager for Spectra-Physics, a leading laser manufacturer. He was elected as an associate member to Spectra-Physics' Scientific Fellowship for his numerous technical contributions to the company, primarily in the area of assembly, test, and calibration automation equipment.

Neil received his BS degree from Ohio State University in Electrical Engineering with specialization in computer design and semiconductor fabrication. He also earned an MBA in finance and marketing from Wright State University. A part-time musician, Neil founded Pumpadoodle Productions, which sells mass customized children's music over the Internet. In addition, he taught on a part-time basis in the Myers University MBA program between 2000 and 2002, and has one issued patent with several others pending.

#### **5) Fuel Cells...An Ohio Story:**

The history of fuel cell development in Ohio is rich and diverse. Ohio based entities have been involved in the development of a broad spectrum of fuel cell types and applications. Ohio's major research institutions, academic institutions, as well as component suppliers and system developers have played a role in the emerging fuel cell industry. There are few regions that offer the manufacturing infrastructure

that evolved in Ohio over the twentieth century in response to the automotive and aerospace industries. In addition to Ohio's colleges and universities, this includes Ohio's Edison Institutions, community colleges, and manufacturing companies. Because of this extensive infrastructure, Ohio has been well positioned to become a center for the creation of a fuel cell industry. Recognizing this competitive advantage, the Ohio Third Frontier Project has successfully invested in fuel cells over the last ten years, building Ohio based businesses and attracting businesses that are new to the state. This presentation will review the background of fuel cells in Ohio, describe the current status, and discuss the opportunities that lie ahead.

Dr. Rodger McKain is the VP Government Programs for Rolls-Royce Fuel Cell Systems (U.S.) Inc., located on the Stark State College campus in North Canton. He received a PhD in physical chemistry from CWRU, an M.S. in physical chemistry from Bowling Green State University and a B.S. in chemistry from the College of William and Mary. He has held research management positions at McDermott International, the parent of Babcock and Wilcox, and at the British Petroleum Company in Cleveland, OH as well as in London. Dr. McKain is a past-chairman of the Ohio Fuel Cell Coalition, past-president of the Cleveland Engineering Society and a member of the board of the Edison Welding Institute. He also is a board member and a member of the Executive Committee of NorTech a regional non-profit organization dedicated to the development of high tech business in NE Ohio. He has been involved in the development of fuel cells since the early 1990's when he was on the management board of the research limited partnership, SOFCo. He is the inventor or co-inventor of three patents and has authored or co-authored over 50 presentations and proceedings.

#### **6) Energy Storage – Enabling Alternative Energy:**

Today's modern electric grid provides reliable electric energy to millions of customers daily. A key component to the reliable operation of the grid is the predictable dispatch and reliable operation of electric generation sources. The continued deployment of alternative energy generation sources such as wind and solar pose significant challenges to maintaining reliable grid operation. FirstEnergy is pursuing a number of developing technologies to address these challenges. These technologies include biomass conversion, large scale battery storage and compressed air energy storage. This presentation will define these technologies including capabilities and potential deployment.

Raymond L. Evans is Director, Environmental, for FirstEnergy Service Company, a subsidiary of FirstEnergy Corp. Mr. Evans is responsible for developing environmental protection strategies that comply with laws and regulations pertaining to all of the company's facilities in Ohio, Pennsylvania, and New Jersey. He also plays a key advising role regarding the operation and maintenance of environmental systems throughout the company and is responsible for technical research, including clean coal technology demonstrations.

Mr. Evans began his career as a junior engineer in 1978 at Cleveland Electric Illuminating Company, which merged in 1997 to form FirstEnergy. He has held a variety of engineering, environmental, commodity risk, and management positions.

Mr. Evans was promoted to manager in the Environmental Department in 1996 and named to his current position in 2009.

A Registered Professional Engineer in Ohio, Mr. Evans earned his bachelor's degree in civil engineering from The University of Dayton. He also is a graduate of Clemson University's master's of environmental systems engineering.

He is a member of the environmental committees of several key industry groups, including the Electric Power Research Institute, the Edison Electric Institute, the Utility Air Regulatory Group, and the Ohio Electric Utility Institute.

### **7) Alternative Energy – Wind Turbine – Educational Development:**

Information regarding the creation of a two year degree in alternative energy – wind turbine major will be presented in this session. The Wind turbine industry requires a number of specific skills that don't fall into traditional degree programs. The specific skills needed span mechanical, electrical, electronic and computer skills. Creation of a so called Mechatronics program was the particular focus of this degree development.

The workers that obtain this degree will be employed by small companies installing residential wind turbines as well large companies that install utility scale machines. Involvement of a wide range of installers, manufacturers and development companies was essential in the summary of the skills needed to compete in this alternative energy industry.

Duncan Estep is the Center Director for Weld-ED, the National Center for Welding Education and Training located at Lorain County Community College. He holds a tenured position as Assistant Professor for this college and has filled numerous educator roles including Interim Dean of Engineering Technologies and Director of the Nord Advanced Technology Center. In these roles, he has developed Engineering curriculum for several energy related degree programs.

Prior to joining Lorain County Community College, Mr. Estep filled a number of engineering and engineering management positions during a 21 year industrial career, including Program Manager at General Electric Healthcare, Vice President of Power Systems at Marconi Communications and Engineering Manager at Chiron Corporation.

Mr. Estep holds a Bachelor of Science Degree in Electrical Engineering and Applied Physics and a Master of Science in Systems Engineering from Case Western Reserve University.

### **8) Materials Needs and Research for Improved Nuclear Power Plant Performance:**

Nuclear reactors present a very harsh environment for components service. Components within a reactor core must tolerate high temperature water, stress, vibration, and an intense neutron field. Degradation of materials in this environment can lead to reduced performance, and in some cases, sudden failure. Clearly, materials aging and degradation will impact reactor reliability, availability, and, potentially, safe operation. Routine surveillance and component replacement can mitigate these factors, although failures still occur.

With potential reactor life extensions beyond 60 or even 80 years, many components must tolerate the reactor environment for a previously unanticipated service life. This may increase susceptibility for components and introduce new degradation modes. This presentation will discuss the most significant degradation issues for extended reactor service, including irradiation-assisted stress-corrosion cracking, irradiation effects in core internals, stress-corrosion cracking in the primary circuit, pressure vessel embrittlement, weldments. While all of these forms of degradation are observed in today's reactors, extended service may increase susceptibility. This will be discussed along with possible mitigation strategies for extended service. Research programs in this area will provide a foundation upon which a safe regulatory environment can be established for life beyond 60 years.

Improved material performance also has the potential enable greater reactor temperatures, new reactor designs, and/or new reactor missions. The application of current, advanced steels to new reactor applications may improve performance significantly over traditional qualified nuclear-qualified

materials. However, the custom design of innovative steels using modern materials science techniques, industrial knowledge, and past experiences could provide revolutionary materials with even greater performance potential. The development of such advanced materials, their impact, and challenges will also be discussed.

Dr. Jeremy Busby is a member of the Senior Research and Development Staff in the Materials Science and Technology Division at Oak Ridge National Laboratory. He received his Master's and PhD from the University of Michigan in Nuclear Engineering, focusing on radiation-damage process and irradiation-assisted stress corrosion cracking (IASCC). In 2004, he joined the research staff at ORNL in the Nuclear Materials Science and Technology Group in the Materials Science and Technology Division. While at ORNL, Dr. Busby has participated in materials research efforts for space reactors, fusion machines, advanced fast reactors, and light water reactors. Currently, Dr. Busby leads the Materials Aging and Degradation Pathway for the DOE Light Water Reactor Sustainability Research and Development Effort. He also leads the Fuel Cycle R&D Program Materials Cross-cut, the Generation IV sodium fast reactor materials effort, and a US contribution to the International Experimental Reactor (ITER) program.

### **9) Advanced Batteries for the New Decade:**

Battery technology has gone from a slowly developing field about 20 years ago to become a growth industry due to new battery types for portable electronics. The present perspective is for even more substantial growth due to the need for hybrid and electric vehicles as well as batteries for grid storage and off grid storage. The talk will consider the battery types, new and old, which will participate in these new applications which will dominate the next decade of green technology.

Dr. George E. Blomgren was educated at Northwestern University, the University of Washington and Columbia University. He then worked in corporate research and Battery Products, Division for Union Carbide Corp. He then worked for Eveready Battery Corp. (Energizer) until 1999, where he held the position of Senior Technology Fellow. He has since worked as a battery industry consultant including a stint as Chief Scientist at Imara Corp. He is author of many standard works on advanced batteries and holds over 18 patents in the field.