

Agenda

Wednesday, Nov. 12 - Group Dinner Romano's Macaroni Grill • 10411 Town Center Dr, Westminster, CO

6-8 PM "Dutch Treat" Group Dinner

Thursday, Nov. 13 - Mechanical Subgroup Meeting National Wind Technology Center • 18299 W. 120th Ave, Louisville, CO

7:30 AM **Registration and Full Breakfast**

8:00 AM **Welcome and Opening Remarks**

8:15 AM **Overview of SMART Wind Consortium and Mechanical Subgroup**

Brent Summerville, Summerville Wind & Sun, SMART Wind Technical Co-lead, Mechanical Subgroup Chair
Trudy Forsyth, Wind Advisors Team, SMART Wind Technical Lead, Mechanical Subgroup Co-chair
Ruth Baranowski, Wind Advisors Team, Co-facilitator

8:45 AM **Introduction of Subgroup Leaders**

Dr. Patrick Lemieux, CalPoly
Gary Harcourt, Great Rock
Robert Preus, NREL (unable to attend)

9:00 AM **Self-introductions by Subgroup Participants**

What do you hope this project to accomplish? What are your areas of expertise?

9:15 AM **Discussion of Barriers and Gaps from survey/interviews**

Facilitated by Subgroup Leaders and Brent Summerville

10:30 AM **Break**

11:00 AM **Turbine design panel: Design methods, FAST Modeling**

Rick Damiani – NREL: Design methods
Jason Jonkman – NREL: FAST
Jeff Minnema – Jeff Minnema Consulting: Experience with FAST, loads

12:30 PM **Lunch**

1:30 PM **Overview of US Casting Industry**

Nick Cannell – Cast Alloy Sales & Technology, Inc.
Joe Banas, Hodge & Elyria Foundries, Inc.

2:45 PM **3D printing, State-of-the-art**

Jacob Segil, Ph.D. – Integrated Teaching and Learning Laboratory (ITLL), University of Colorado
Steve Huddle – University of Colorado Lab Manager

3:30 PM **Break**

3:45 PM **Report from Rapporteur**

Ruth Baranowski – Communications Director, Wind Advisors Team

4:45-5 PM **Next (virtual) meetings & close of meeting**

OBJECTIVE

For participants of the SMART Wind Mechanical subgroup to meet each other, identify gaps and opportunities, learn about state-of-the-art manufacturing methods and technologies and capture information for Roadmap.

Friday, November 14 - Half Day Wrap-up Meeting (Invitation only for Subgroup Leaders, OEM Steering Group and Core Team)

8:45 AM **Coffee and Welcome**

9:00 AM **Debrief Mechanical Subgroup Meeting**

Brent Summerville, Summerville Wind & Sun, SMART Wind Technical Co-lead, Mechanical subgroup chair
Trudy Forsyth, Wind Advisors Team, SMART Wind Technical Lead, Mechanical subgroup Co-chair

9:30 AM **Thoughts from Subgroup Leads**

Dr. Patrick Lemieux (CalPoly)
Gary Harcourt (Great Rock)

10:00 AM **Break**

10:15 AM **Discussion on what worked, what could be better, next steps, lessons learned**

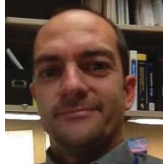
11:30 AM **Summary of action items and next steps**

12:00 PM **Close of meeting**

Bios

**Joe Banas - Hodge & Elyria Foundries, Inc.**

Business Development at Hodge Foundry for the past 9 years; graduate of Penn State University. Hodge Foundry has been producing ductile iron castings for the wind industry since 2002. Hubs, bedplates, gearbox housings and other ancillary castings range from 50 lbs to 200,000 lbs. He has been involved in commercial and technical discussions with companies such as GE, Vestas, Siemens Windpower and many more about manufacturing ductile iron casting in the U.S. to supply OEM's domestic assembly facilities.

**Dr. Rick Damiani, PhD, PE - Senior Engineer
National Renewable Energy Laboratory**

Dr. Rick Damiani has been a consultant to the wind industry for the last 15 years. He focuses on aeroelastic modeling of turbines and structural design and analysis of blades and support structures. For the National Wind Technology Center (NREL), he supports various technical projects from offshore wind to DWT. He holds a PhD in Aeronautical Engineering and is a Licensed Professional Engineer.

**Ruth Baranowski - Communications Director
Wind Advisors Team**

Ruth serves as the Secretary for the SMART Wind Consortium, documenting meetings and outcomes, and is the editor for the Roadmap. Her 11 years of experience working with the wind industry, including serving as the communications coordinator for the DOE's Wind Powering America initiative, provides a solid foundation for understanding key concepts and terminology. Ruth holds a BA in mass communications with a political science minor from Colorado State University Pueblo, and a MS in technical communications from the University of Colorado Denver.

**Trudy Forsyth - Managing Director
Wind Advisors Team**

Trudy Forsyth more than 20 years of experience in wind technology. She led the DOE/NREL small and distributed wind program for 18 years where she helped design new US small wind turbines, test prototypes and commercial turbines to standards, develop international and national standards, and develop distributed wind marketing and education materials. She worked closely with DOE program managers to develop multi-year strategies and implement program objectives. She is currently the president of the SWCC Board, past president for Women of Wind Energy and a DWEA board member. She holds a BS and MS in mechanical engineering.

**Mike Bergey - President
Bergey Windpower**

A co-founder of Bergey Windpower and president since 1987, Mike is a mechanical engineer and an internationally recognized expert in small wind turbines, distributed generation, and rural electrification. He holds one patent in the wind energy field.

**Matthew Gagne
Development Consultant & Market Analyst
eFormative Options**

Matthew has worked in the wind energy industry since 2006 in both utility and distributed wind spheres, including data analysis, GIS analysis, and technical writing. He holds a BA in journalism with emphases in statistics and geography.

**Tom Bugnitz - CEO
Manufacturer's Edge**

Tom Bugnitz has over 35 years of broad experience in strategic planning, operations and financial oversight. Most recently, Tom was a senior executive for Coolerado, a manufacturer of cutting-edge green air-conditioning systems that grew from five to 60+ employees during his tenure. As founder and president of the Beta Group, Inc., Tom advised corporate and government clients across the globe for over 25 years in business strategy development, cross-organizational team building, management process, and organizational redesign.

**Gary Harcourt - Manager and Co-owner
Great Rock Windpower**

Commissioning Engineer, Endurance Windpower
With Great Rock Windpower, Gary Harcourt helped install and helps maintain a small fleet of turbines in Massachusetts. Gary also travels for Endurance Windpower as a commissioning engineer training installers and technicians in North America and Europe. On the NABCEP small wind exam committee, he helped craft the first installer certification exam (he was certified as a NABCEP Level III small wind installer). He currently serves on the DWEA Planning and Zoning committee and is a board member for the Small Wind Certification Council.

**Nick Cannell - Marketing and Sales
Cast Alloy Sales & Technologies, Inc. (CAST)**

Nick has over 30 years of experience in metal casting with a solid background in tooling. His experience includes production, management, R&D, and sales. He is an active member of the Ohio Cast Metals Association, current Secretary with both the Cleveland-Akron-Canton chapter of the American Foundry Society, and the Cleveland Chapter of the North American Die Casting Association. With EMTEC, he was primarily involved in technology transfer within the casting industry including rapid prototyping, solidification modeling, and computed tomography reverse engineering/metrology. He was also the project manager for the creation of a mobile foundry (TacFab) for the US Army. Nick is currently a partner in Cast Inc. located in Northeast Ohio.

**Steve Huddle - Professional Research Assistant
Bioengineering, University of Colorado Denver**

The biomechatronics lab at the University of Colorado Denver, is using additive manufacturing technology (i.e., 3D printing) to develop and design new innovative upper limb prosthetic devices. Recent work includes designing and prototyping an ab/adduction shoulder joint providing an additional degree of freedom for an existing upper limb prosthesis, and creating a control algorithm and circuit for EMG signal processing to control a two degree of freedom actuator.

Bios



Anant Jain - Renewable Energy Engineer, Intertek
Working with the wind turbine certification group at Intertek, where he has been primarily focusing on the design evaluation module of the wind turbine certification system. Holds a MS in Mechanical Engineering and will be graduating with a PhD in Wind Science and Engineering in December 2014 from Texas Tech University. Served as the primary author of a paper on "FAST Code Verification of Scaling Laws for DeepCwind Floating Wind System Tests" presented at the International Offshore and Polar Engineering Conference in Greece in 2012.



**Jennifer Jenkins, Executive Director
Distributed Wind Energy Association**
More than 10 years experience in the wind industry, including at Southwest Windpower in their Government Affairs department. She was an integral part of the team that successfully sought passage of the Federal 30% tax credit for small wind systems. In her current role as Executive Director of DWEA, she works directly with members, stakeholders, and policy makers to find opportunities to grow the distributed wind market. She earned a BS in environmental science with an emphasis on policy and public administration from Northern Arizona University.



**Dr. Jason Jonkman, Ph.D. - Senior Engineer
National Renewable Energy Laboratory**
Joined NREL in 2000 and is the lead developer of the FAST and FAST-to-ADAMS preprocessor computer simulation software for modeling the dynamic response of land- and offshore-based wind turbines. He also provides technical support to designers, consultants, and researchers throughout the wind energy industry. He has performed studies to verify and validate the simulation software, has published many papers on wind turbine dynamics, and has assisted in the certification of wind turbine design loads. He holds a PhD in Aerospace Engineering Sciences from the University of Colorado Boulder.



**Dr. Patrick Lemieux
Associate Professor of Mechanical Engineering
California Polytechnic State University**
Bently Professor of Mechanical Engineering at Cal Poly, involved with wind power research for over 20 years. Over past 6 years, has developed Cal Poly's Wind Power Research Facility and presented progress made at AWEA conferences nationally as well as in a federal congressional panel on energy issues. The facility's goal is to prepare the next generation of wind power mechanical engineers by studying and developing systems according to a design philosophy relevant to utility-scale wind turbines, but implemented to small machines suitable for university research and teaching. Prime area of research focuses on the aerodynamic design and control of wind turbine blades; interests include the turbine system assembly and structure as a whole. Also concerned with issues regarding global energy sustainability and climate change.

**Dr. Paul Migliore, PhD - Managing Member and
Principal Investigator, Anemergonics**
Dr. Migliore has 35 years' experience in virtually all aspects of wind energy, including research and



teaching in academia, wind farm development, engineering design, manufacturing, consulting and project management. Since retiring from NREL in 2005, Dr. Migliore has consulted for numerous wind turbine manufacturers, primarily in the areas of aerodynamics, aeroacoustics, foundations, and tower design. As a consultant to NREL assisted with the implementation of computational aeroacoustics projects and wind tunnel aerodynamic and aeroacoustic tests. Was also under contract to report on wind tunnel tests of candidate low-noise blade tips for small wind turbines. Dr. Migliore has his BS, MS, and PhD in aerospace engineering from West Virginia University and an MS in systems management from the Univ. of Southern California.



**Jeff Minnema - Lead Engineer, President
Jeff Minnema Consulting, LLC**
Worked exclusively in wind energy since 1994. Has a BS Mechanical Engineering from the University of Michigan and an MS Mechanical Engineering from the University of Utah where he worked with Dr. Craig Hansen. Jeff has worked with many Wind Energy companies over the past 20 years. He specializes in building and running Aeroelastic computer models of wind turbine systems using FAST and other NREL supported programs. He is also skilled in aerodynamic design of blades.



Scott Morton, PE - University of Wyoming (retired)
Scott Morton, a Wyoming native, received BS and MS degrees in agricultural engineering from the University of Wyoming in 1972 and 1978, respectively. He worked as an engineering consultant, a self-employed business owner and a plant engineer before joining the University of Wyoming faculty as a research scientist in 1999.



**Charles Newcomb - Director of Technical Strategy
Endurance Windpower**
Serves as Endurance's Director of Technical Strategy to align the company's technical solutions with business strategies. Brings more than 15 years of experience in nearly all aspects of the wind industry from sales and project development of wind projects to procurement and implementation strategies. Works with Endurance's technical team on the company's future product roadmap and business models. Prior to joining EWP Newcomb held several senior engineering roles at NREL.



**Robert Preus, PE - Technical Lead
for Distributed Wind
National Renewable Energy Laboratory**
Robert was the founder of Advanced Renewable Technology, which provided training, engineering, and certification support in small wind manufacturers. He has 27 years of experience in wind energy. He led the successful development of 2.5 kW to 300 kW wind generators. He has extensive experience in design of wind energy systems. He has trained many dealers in the installation of distributed wind systems and served on the committees that developed NABCEP installer certification task list, applicant experience requirements and the exam writing. He was the cochair of the group that wrote a section for small wind in the NEC.

Bios



Heather Rhoads-Weaver - Principal Consultant, eFormative Options LLC

Heather is the founder of eFormative Options, providing market and policy analysis, project and organizational development, and stakeholder communications focused on forming and advancing sustainable endeavors. Heather is the elected Secretary for DWEA's Board of Directors and serves as DWEA's State Policy Director. eFormative is a subcontractor to the Clean Energy States Alliance compiling the NARUC Energy Zones policy inventory, drawing on experience developing other policy analysis dashboard tools and managing complex datasets. Other current and recent clients include the Pacific Northwest National Laboratory, Minnesota Renewable Energy Society under the state's Department of Commerce, and the Small Wind Certification Council. She holds an M.S. from the University of Northern Iowa and a B.A. from Wesleyan University.



Brian Smith - Deputy Director National Wind Technology Center National Renewable Energy Laboratory

Brian is the Acting Deputy Director of the NWTC at NREL, focusing on partnership development, capability enhancement, and strategy. He served as NREL's Laboratory Wind and Water Power Program Manager from 2002–2014 and was responsible for managing commitments to the DOE Wind and Water Program Technologies Office. He is the US Alternate Member and Vice Chair of the Executive Committee for the International Energy Agency Implementing Agreement for Wind Energy Systems RD&D and serves on the Advisory Board for the European Union Technology Platform for Wind Energy (TPWind).



Dr. Kim Stelson, Sc.D - Professor and Director Center for Compact and Efficient Fluid Power University of Minnesota

Dr. Stelson is the founding Director of the NSF-funded Engineering Research Center for Compact and Efficient Fluid Power, a global leader in fluid power research. The CCEFP is a network of seven universities and 50 companies conducting pre-competitive research on transformational fluid power technology. During his management of the CCEFP, he has demonstrated the ability to attract a broad base of industry participants, while bringing together the foremost researchers around the US in the fluid power industry. His fluid power research includes work on hydraulic hybrid vehicles and hydrostatic transmissions for wind power, and his manufacturing research includes modeling and control of metal forming, polymer processing and composite materials manufacturing.



Kurt Sahl - Communications and Development Consultant, eFormative Options

Kurt spent 25 years working in science and technology instruction, research and consulting, most recently at the University of Washington Center for Teaching and Learning. During his doctoral studies, Kurt co-authored articles about computers and teacher cognition and a book for teachers about online learning. He received his BS in entomology from the University of Idaho and his Masters of Education in educational communications and technology from the University of Washington.



Dr. Jacob Segil, Ph.D. - Teaching Faculty University of Colorado Boulder

Jacob is an instructor for General Engineering Plus and Mechanical Engineering degree programs. Jacob has a B.S. in Mechanical Engineering with a minor in Bioengineering from the University of Illinois at Urbana-Champaign, a M.S. in Mechanical Engineering with a Bioengineering focus and a Ph.D. in Mechanical Engineering from UC Boulder. Jacob researches brain-machine interfaces, neural prosthetic devices, and myoelectric control systems. Jacob enjoys teaching mechatronic design, experimental design, and statistics.



Brent Summerville, PE - Principal Engineer and President, Summerville Wind & Sun

Brent is a licensed Professional Engineer in North Carolina. After working as a manufacturing engineer for a decade, he started his career in renewable energy at Appalachian State University by designing, installing, troubleshooting and providing training on renewable energy projects. He gained extensive experience testing small wind turbines while serving as the manager of the ASU Small Wind Research & Demonstration Site on Beech Mountain. He is currently the Technical Director of the Small Wind Certification Council and Technical Co-Lead for the DWEA SMART Consortium project. He has a BS in Mechanical Engineering from North Carolina State University and a Masters in Appropriate Technology from Appalachian State University.



Wesley Slaymaker - President, WES Engineering

Wes Slaymaker has 14 years of experience working in the wind energy business. He is President of WES Engineering Inc, a 10-person firm specializing in wind project development for mid-sized turbines for Schools, Farms and Industrial Clients. He has a Bachelors of Mechanical Engineering from Georgia Tech, and is a registered Professional Engineer in Minnesota and Wisconsin. He has assisted in all aspects of the development, construction management, and operations of wind turbine projects ranging in size from a single 35 kW turbine in Minnesota, to a 10 MW wind turbine project in Wisconsin. His duties include the installation and monitoring of wind measurement equipment, assistance in operations of wind turbines, turbine layout, permitting, electrical interconnection, and construction supervision.



Jay Yeager - Senior Applications Engineer Xzeres Wind Corp

Jay is a wind industry veteran with extensive background and experience in small wind turbine technologies, manufacturing, field testing, wind turbine certification, product development and design, project management and distributed wind systems development around the world. He has focused greatly on village electrification in underserved and remote locations with full cycle involvement from resource assessment to siting to modeling and system design, funding, deployment, installation and commissioning.