

Blue Ridge Wind Collaborative

Final Metrics Report Collegiate Wind Competition 2024

Institution Names & Locations

Virginia Tech, Blacksburg, Virginia

James Madison University, Harrisonburg, Virginia

Connection Creation Team

Jaedyn Williams	Student Leader
Sean Do	Student Leader
Ayah Ali	Communications
Jackson Andrew	Communications
Quinn McIver	Communications
Isabella Lindblad	Student Leader
Eliana Lewis	Communications
Nicole Parks	Outreach

Faculty Advisors

Dr. Nanyaporn Intaratap **Aerospace & Ocean Engineering**

Dr. Jonathan Miles **Integrated Science and Technology**

Recruitment Strategy Outcomes

For the 2024 Collegiate Wind Competition (CWC), 40 students from Virginia Tech (VT) and 10 students from James Madison University (JMU) are excited to partner as one team branded as the Blue Ridge Wind Collaborative (BRWC). As of Fall 2023, the approximately 38,000 VT students are 57% male and 43% female. The latest specific demographic data are from 2021, with 58.5% of the student body Caucasian, 10.6% Asian, 8.0% Hispanic or Latino, 5.4% Black or African American, 4.7% two or more races, and 0.2% other. As of Fall 2022, the approximately 20,000 JMU students are 42% male and 58% female. The latest specific demographic data are from 2021, with 75% of the student body being Caucasian, 7.0% Hispanic or Latino, 4.9% Black or African American, 4.8% Asian, 4.8% two or more races, and 0.2% other. The BRWC team's overall makeup is 60.0% Caucasian, 24.0% Asian, 8.0% Hispanic 6.0% African American, and 2% two or more races, making for a team that is more diverse than the general student populations at VT and JMU. The team will continue their commitment toward making the team racially and ethnically diverse for future competitions. In addition, 24% of the members are female and 76% are male, which is expected due to women representing 21.9% of engineering students at VT during Fall 2023. Recruitment efforts enabled the team to grow from 36 to 50 over the last year. Efforts to expand beyond just engineering majors have resulted in increased participation from the following majors: Biology, Computer Science, Earth Sciences, Engineering, Geography, Integrated Science and Technology, Public Administration, and Sociology. This year, our team was able to recruit members from a diverse range of majors and welcomed 17 freshmen to the team.

Strategies to recruit students from such a diverse range of majors included emailing recruitment slideshows and flyers to academic advisors, serving as guest speakers during classes, and attending several recruitment events (see Figure 1). These strategies yielded an uptick in team member recruitment, with the number of students rising from 36 students in 2022-2023 (VT) to 42 students 2023-2024 and 9 students in 2022-2023 (JMU) to 11 students 2023-2024. To begin recruitment for next year's competition early, the team tabled at the VT Student Organization Fair for prospective freshmen (see Figure 2) in addition to the normal recruiting period in the Fall semester. In the future, the BRWC plans on attending Society of Women Engineers (SWE) events to improve recruitment for female members.

Social Media Metrics

This year, BRWC's social media accounts focused on Instagram and LinkedIn. The team chose these social media platforms because they allowed us to stay connected with alumni and provide a better professional platform. This enabled the team to connect with industry professionals. From the beginning, the goal was to enhance the team's presence on Instagram and make an insightful impact on the platform by connecting with industry and community members. The main accounts that the team has been using are @blueridgewind on Instagram and the Blue Ridge Wind Collaborative on LinkedIn featuring both Virginia Tech and James Madison University. The original plan for the team's social media plan on Instagram was to gain more followers and continue to grow the team's platform. The team posted twice per week between October 19, 2023, and April 15, 2024. The current number of followers is 237, with likes at around 66 per post. Over the last couple of months, the account reached more than 730 accounts from "Meet the Team Mondays" posts (see Figure 3) and "Myth or Facts Fridays" (see Figure 4). Additionally, on the team's LinkedIn, the team was able to reach a greater audience by promoting the work that the members were accomplishing. The team had more than 241 page views over the last couple of months following the team's progress in the competition. By engaging the team's audience, they were able to successfully understand the team's mission in the competition when viewing stories and commenting on posts. The BRWC also plans to continue posting to accounts (see Figure 5) in the upcoming weeks before the competition, uploading content about prototype testing, the competition in Minneapolis, and any final placement.

Three Selected Connection Creation Contest Activities

Interteam Alumni Event

The first selected contest activity was the Pathways to Wind Energy Discussion. The purpose of this discussion was to give current students a better understanding of the wind industry, transitioning from the CWC to industry, valuable experiences for students involved in CWC, and post-graduation opportunities, through CWC alumni perspective. BRWC planned this inter-team alumni activity with two other CWC teams on the East Coast by reaching out to Johns Hopkins University (JHU) and Penn State University (PSU) students to connect with alumni and professionals outside of VT and JMU. Members from VT, JMU, PSU, and JHU first met in December 2023 to plan and discuss the inter-team alumni event. The teams followed up with each other once in January and again in February of 2024. The activity was organized as a virtual panel discussion with CWC alumni, university alumni, and industry mentors.

There were 46 people who registered to attend the event. Among the attendees were current students and team advisors from each prospective school. There were 10 members from VT, 5 from JMU, 15 from PSU, and 16 from JHU. The industry representatives from VT were Hayley Capilitan and Emily Philpott, who are both CWC and VT alumni. Capilitan is currently a Wind Blade Structural Design Engineer with the Edison Engineering Development Program at GE Vernova and Philpott is a Renewable Energy Analyst at Burns & McDonnell (see Figure 6). The industry representatives from JMU were Nicole Peterson and Jamie Mears, who are both CWC and JMU alumni. Peterson is a Wind Resource Analyst at Apex Clean Energy and Mears is a Senior Associate for Project Development at Orsted (see Figure 7). The representatives for PSU were Katie Bowser who is a CWC and PSU alumna, and Kristin Dugas who is an industry mentor. Bowser is a part of the Commercial Leadership Program at GE Vernova and Dugas is an Operations Engineering Manager at Scout Clean Energy. The industry representative for JHU was Bill McNamara who is a JHU alumnus and the President of EcoEnergy LLC. Engagement overall was successful in developing connections and learning what industry professionals had to say. At the end of the event, attendees were engaged and asked additional questions for thirty minutes. All of the teams received positive feedback after the event and felt that the discussion was valuable.

Understanding the Wind Industry

The second contest activity was to complete the *Understanding the Wind Industry* deliverables (see Table A). This activity provided current members the opportunity to understand current technologies and ongoing challenges that the wind industry faces. Connecting with industry members allowed the team to network and gain connections that are valuable while starting a career in the industry. One of the industry professionals interviewed is Dr. Kenneth Brown who is a VT alumnus working as an Aerodynamic Diagnostics (see Figure 8) and Modeling Engineer at Sandia National Laboratories. Dr. Brown discussed his work during graduate school and opportunities for students who are interested in work that bridges the gap between industry and research. The second industry professional interviewed is Joel Rubin, who is the director of the WINDdays campaign in the Hampton Roads area (see Figure 9). Rubin is an industry representative who reached out to JMU and VT members two competitions ago to learn more about the CWC and to write stories for his WINDdays campaign. To stay connected with Rubin, the team reached out to him to understand the media side of promoting wind energy. The third interviewee was Sarah Davis, who is a Transmission Manager at Apex Clean Energy (see Figure 10). Davis is a professional contact that was developed through an internship at Apex. The fourth industry contact is Ralph Kurth, who is currently the Senior Principal and Practice Lead at Stantec (see Figure 11). Kurth is a professional contact who was previously a CWC contact.

Full name	Company affiliation	Email address	Interested in attending future CWC events
Kenneth Brown	Sandia National Laboratory		Yes
Joel Rubin	Rubin Communications Group		Yes
Sarah Davis	Apex Clean Energy		Yes
Ralph Kurth	Stantec		Yes

Table A. Understanding the Wind Industry Metrics

In addition to the four interviews completed as part of the *Understanding the Wind Industry* Deliverable, the BRWC spoke with ten other industry professionals from various sectors of the wind and renewable energy industry for a total of 10 connections. Industry connections provide valuable insight into developing concepts for hybrid wind production (see Project Development Report (PD)), helped guide financial analyses, and provided suggestions for how to address challenges the PD team encountered such as transmission systems in the wind industry and renewable energy field as a whole.

Student and Local Community Engagement

1. Student Engagement

K-12 Activities

The third contest activity involved student and local community engagement through a presentation and hands-on activity. Team members engaged in many events in the Blacksburg and Harrisonburg communities to advance community knowledge of renewable energy and the pressing need for its advancement. Team members mimicked the 2024 CWC challenge by tasking the high school with creating an offshore wind turbine foundation under two different water depths and wind speeds. Eight members led the Blacksburg High School events (AP Physics C and Robotics classes), with the classroom attendance averaging 25 students (see Figure 12). The team members began by presenting slides about the CWC foundation task and the parameters for the simulation tank. Team members simulated a similar activity in Harrisonburg with another hands-on design challenge. Three team members led the Bluestone Elementary students and three members led Stone Spring Elementary students ranging from first to fifth grade, with each school's attendance averaging 30 students (see Figure 13). The lesson plan was designed to give the students an overview of wind energy, how it works, and why it is important, but also incorporated an interactive design challenge. For the design challenge, students were tasked with designing the foundation using provided materials to test under varying conditions such as different wind speeds and water depths (see Figure 14). By combining informative discussion with a hands-on design challenge, the BRWC not only met outreach goals of promoting renewable energy awareness and knowledge of wind energy but also inspired the next generation to envision a more sustainable future.

Maker Mondays Mentorship

In addition to working with students in Blacksburg and Harrisonburg, members of the BRWC mentored students from across Virginia in wind turbine fundamentals every Monday. The weekly meetings were called Maker Mondays (see Figure 15). While topics varied, generally each Maker Monday started by watching a brief YouTube video on innovative concepts not typically seen on large-scale wind turbines like shrouds or Archimedes wind turbines. Following each video, BRWC

members would open a Q&A session, which typically led to explanations of fundamental concepts such as basic aerodynamics, grid system engineering, and construction logistics challenges. To conclude Maker Mondays, members of the BRWC joined Virginia Tech's Center for Enhancement of Engineering Diversity (CEED) in hosting the Southwest Virginia Regional Kidwind competition by coaching teams through problems such as generator malfunctions, rotor imbalances, and improper circuit design.

2. Local Community Engagement

KidWind Regional Competition

Team members volunteered at the State KidWind Regional Competition participating in various activities. The team worked with the elementary, middle, and high school competitions (see Figure 16). The elementary school students were tasked with creating an offshore floating wind development, the middle schoolers a sitting design based on the collegiate wind competition, and an energy flow chart for high school students (see Figure 17). Through these events, students were able to connect with the community from young students to their adult guardians and teachers through these competitions. Our team fostered community connections and inspired the next generation of citizens by actively participating in the State KidWind Regional Competition and leading engaging activities for students of all ages.

Final Outreach Event Reflections

Reflecting on the BRWC outreach events, the team has successfully reached out to a wide range of community members and industry participants. The BRWC surpassed the total impression goal of between 600 and 1,000 impressions, reaching more than 2,510 people through these events. As a part of the kickoff to Earth Month, two members presented at the third annual Sustainability Summit put together by Sustainable Shenandoah Valley (see Figure 18) on April 6th, 2024. The summit was held at JMU this year, where presenters connected their research projects, organizations, or clubs to the UN's 17 Sustainable Development Goals (SDGs). Team members engaged in a panel with local businesses and organizations rooted in promoting a shift towards global environmental goals. The team members presented to 15 individuals during the second presentation session. The presentation addressed the history of wind energy, the CWC, the BRWC, and the benefits of a turbine farm in a rural community. Team members highlighted the benefits of wind and renewable energy. Focusing on the benefits to communities around the globe, offering job creation and economic diversification while increasing energy security. An upcoming event the team is now planning will celebrate Earth Month and Week with fun activities. This outreach event is partnered up with various environmental groups on campus and includes a sustainable potluck and clothing swap. This event builds up recruitment for next year and engages us in the community, while also enabling team members to partake in fun activities that are environmentally focused with other organizations passionate about other environmental goals.

Appendix

Outreach Photos & Graphics For Social Media



Figure 1. Student Organization Fair to Prospective Freshmen.



Figure 2. VT Science Fair.

MEET THE TEAM

Sai Ashraya Chegu

Civil Engineering with Environmental Engineering Concentration
Senior
Project Development

I love all things music: I sing Indian Classical music and play the alto sax!



MEET THE TEAM

Georgia Barefoot

Integrated Science & Technology
Senior
Project Development

I am a certified welder!



Figure 3. “Meet The Team Monday” social media post.

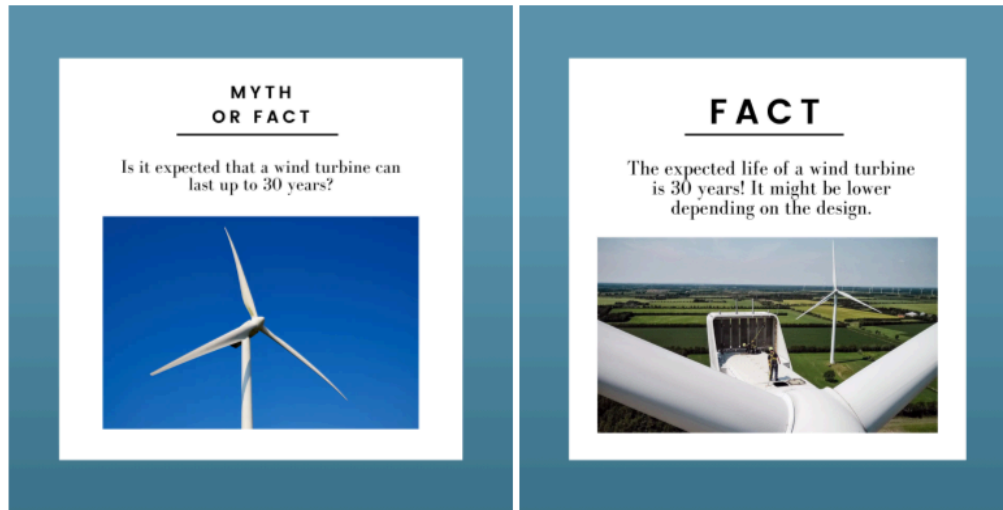


Figure 4. “Myth or Fact Friday” social media post.



Figure 5. Prototype Design Testing in Goodwin Wind Tunnel.

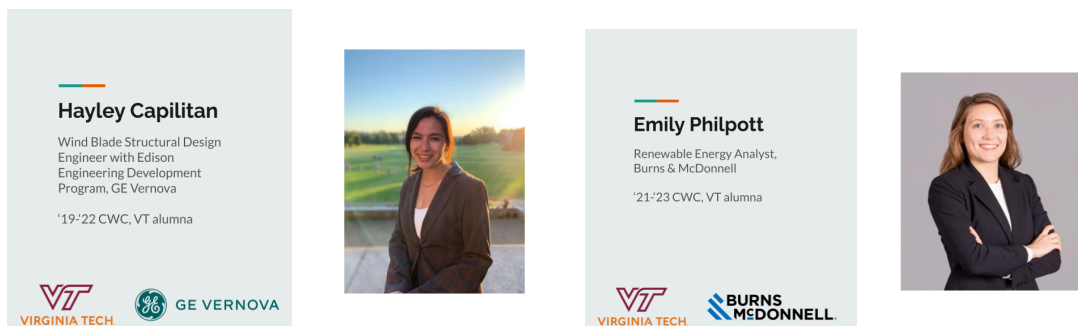


Figure 6. VT CWC Alumni for Pathways to Wind Discussion Panel.



Figure 7. JMU CWC Alumni for Pathways to Wind Discussion Panel.



Kenneth Brown

Aerodynamic Diagnostics and Modeling Engineer

Job description

- © Dr. Brown joined Sandia National Laboratories in 2019 and supports the Scaled Wind Farm Technology (SWIFT) experimental facility.
- © Works on the validation of wind turbine wake models and novel wake control strategies.
- © Researches concepts that are underdeveloped for industry.
- © Specializes in reduced-order modeling, flow diagnostics, and wind tunnel testing, low-speed propulsion, and turbomachinery sectors.
- © Renewable Energy Laboratory (NREL), Pacific Northwest National Laboratory (PNNL), and Oak Ridge National Laboratory.

You might like this job if you like:

- © Operating in wind farm aerodynamics
- © Working with simulation work and validating models
- © Reliability testing
- © Dealing with bridging the gap between academia and industry

Career requirements

- © Bachelor's and Master's degree in engineering
- © Internship experience in the wind industry
- © Undergraduate or graduate research experience
- © Experience in aerodynamic engineering
- © Understanding of flow diagnostics, wind tunnel testing, and validation methodologies for renewable energy applications

Photo courtesy of Kenneth Brown

Team credit: Virginia Tech with James Madison University

Figure 8. Understanding the Wind Industry.



Photo courtesy of Joel Rubin

Team credit: Virginia Tech with James Madison University

Joel Rubin

Director of WINDSdays Campaign

Job Description

- ⊙ Joel started his own weekly campaign called WINDSday.
- ⊙ WINDSday was inspired by Dominion Energy's wind farm project off the Virginia Beach coast providing sustainable electricity to approximately 660,000 homes in the state.
- ⊙ Founder of Rubin Communications Group.
- ⊙ Involved with clients in the maritime space.
- ⊙ Promoting Wind Energy in Hampton Roads area by building a culture around clean energy and the power of wind
- ⊙ Conducts interviews and partners with local businesses in weekly campaign to connect the community

You might like this job if you like:

- ⊙ Speaking publicly
- ⊙ Exercising prior film or writing experience
- ⊙ Networking and fostering relationships
- ⊙ Working in the community
- ⊙ Working Independently
- ⊙ Writing
- ⊙ Advocating about a sustainable and green environment
- ⊙ Interests in the renewable energy industry

Career requirements

- ⊙ Journalism experience
- ⊙ Public relations skills
- ⊙ Knowledge of digital media
- ⊙ Interpersonal communications
- ⊙ Local media/reporter experience
- ⊙ Communications with local community members

Figure 9. Understanding the Wind Industry.



Photo courtesy of Sarah Davis

Team credit: Virginia Tech with James Madison University

Sarah Davis

Transmission Manager at Apex Clean Energy

Job description

- ⊙ Sarah leads transmission analytics in the Western Electricity Coordinating Council (WECC) to guide placement and interconnection strategy for new large-scale wind, solar, energy storage, and hydrogen production facilities.
- ⊙ Conduct advanced steady state, deliverability, production cost modeling, and dynamic stability studies.
- ⊙ Perform deliverability assessments to evaluate ability to acquire firm Point-to-Point Transmission Service.
- ⊙ Mentor and train engineers and non-engineers on transmission planning and interconnection study practices.

You might like this job if you like:

- ⊙ Working with people from various disciplines
- ⊙ Managing multiple projects at once
- ⊙ Monitoring policy around transmission expansion
- ⊙ Using Power Grid Modeling Tools such as PowerWorld, PSSE, PSLF, Tara, PROMOD
- ⊙ Making impactful decisions on the fly and thinking outside the box

Career requirements

- ⊙ Bachelor's degree in electrical and power engineering
- ⊙ Strong communication skills to accelerate large scale renewable integration
- ⊙ Coding skills to automate and post-process wide-area power system studies

Figure 10. Understanding the Wind Industry.



Photo courtesy of Ralph Kurth

Team credit: Virginia Tech with James Madison University

Ralph Kurth

Senior Principal and Practice Lead at Stantec

Job description

- © Ralph has over 35 years of expertise in power system projects, specializing in HVDC transmission systems, AC substations, and automation systems.
- © Currently leads Stantec's team on the EuroAsia project, connecting Cyprus to the European grid with the deepest submarine power cable worldwide.
- © Designs offshore wind project with HVDC transmission, substation design, control and protection, commissioning and project management.
- © Demonstrates strong leadership, business development, strategic outlook and critical thinking abilities.

You might like this job if you like:

- © Working in a technical leadership position
- © Collaborating with other companies
- © Budgeting & forecasting
- © Consulting
- © Strategic planning
- © Developing new innovations in renewables

Career requirements

- © Bachelor's degree in engineering or STEM related field and pursuing or holding a higher educational degree
- © Internship or full-time experience with underwater, high-voltage transmission design and financing.
- © Working in groups to produce a uniform project
- © Exceptional leadership skills, business development acumen, and strategic thinking in the renewable energy sector

Figure 11. Understanding the Wind Industry.



Figure 12. Blacksburg High School Outreach Activity.



Figure 13. STEM Corps Activity: Floating Foundation event at local elementary school.



Figure 14. STEM Corps Activity: Floating Foundation event at local elementary school.

Zoom Meeting You are viewing Jaedyn Williams' screen View Options

Alexandra Oleski Perry Martin - Virginia Te... Jaedyn Williams Sean Do Ariah Kamiryn McClarin

Recording Sign in

Testing Setup

(a)

(b)

(a) Turbine, structure, and anchorage allowable volumes and (b) tank layout. Image created by Jason Roadman, NREL

section or just stop me at any time. But this is just a little diagram of the testing setup that it'll look like in May when we go to Minneapolis. It is about 20 cm of sand. And then 10 cm of water. And then

Unmute Stop Video Security Participants Chat Share Screen Record Hide Captions Reactions Apps Whiteboards Notes More Leave

Figure 15. Maker Monday Zoom Meeting.



Figure 16. State Kidwind Competition at JMU.



Figure 17. State Kidwind Competition at JMU.



Figure 18. JMU's Sustainability Summit.