

CENTER *for the* ADVANCEMENT *of* SUSTAINABLE ENERGY

ANNUAL REPORT
2019-2020



CENTER *for the*
ADVANCEMENT *of*
SUSTAINABLE ENERGY
JAMES MADISON UNIVERSITY

DIRECTORS' STATEMENTS



JONATHAN MILES

Executive Director

We are pleased to present here the first **Annual Report** of the *Center for the Advancement of Sustainable Energy* (CASE) at James Madison University. CASE was derived from the former Center for Wind Energy, but presents a broader mission that addresses *solar and wind power, energy storage, efficiency, and conservation*, all within the contexts of *education & training, community outreach, and research & development*. CASE continues to advance projects that serve the clean energy priorities of Virginia and the Mid-Atlantic region, and provide opportunities for students, faculty, and others engaged to build a cleaner energy future for all.



REMY PANGLE

Managing Director

This past year was memorable, as the *Center for the Advancement of Sustainable Energy* was recognized by JMU, and an Advisory Board formed that comprises a diverse collection of energy professionals. CASE staff and leadership created a vision to advance sustainable energy in Virginia and the region and re-designed our website accordingly. We are thankful for staff that are dedicated to our mission to advance knowledge, understanding, acceptance, development, and deployment of sustainable energy, and we will continue building strategic partnerships with like-minded organizations in 2021 and beyond.

2019-2020 YEAR IN REVIEW

The Academic Year 2019-2020 coincided with monumental change in terms of the role and future of energy in Virginia. In September 2019 the inaugural Virginia Clean Energy Summit was held in Richmond, at which Governor Ralph Northam announced his signing of Executive Order No. 43 which set aggressive goals for the deployment of solar and wind, both inland and offshore, as well as for energy efficiency, energy storage, and energy equity. Complementary to the governor's directive, the Virginia Department of Energy led an effort to form the Virginia's 17th Career Cluster, that is designed to introduce students to the energy industry and help develop a pipeline of graduates who are equipped to join the growing energy workforce.

This past year also saw progress made throughout the Commonwealth in terms of advancing solar deployment as well as wind power both inland and offshore. As of early 2020, Virginia was the second-most productive state in the Mid-Atlantic in terms of total utility-scale solar energy production, while plans were moving forward to construct the first utility-scale wind power plant in Virginia in Botetourt County and Dominion Energy was preparing to deploy the first-ever offshore wind turbines in U.S. federal waters. We are seeing today, a significant shift toward non-carbon-emitting energy sources to serve the growing demand for electric power tomorrow.

The Center for the Advancement of Sustainable Energy at JMU has continued to develop and support programs designed to educate and train the future clean energy workforce, has maintained a steady schedule of outreach events and programs to advance deployment of clean energy systems, and engaged throughout the year in research involving undergraduate and graduate students supported by dedicated faculty to further enable progress in this critical field.

Year In Review Highlights:

17TH CAREER CLUSTER ON ENERGY

The energy industry represents a vital part of Virginia's economy. The new 17th Career Cluster in Energy introduces students to the industry, provides information on job opportunities needed to meet growing workforce demands, and develops a talent pipeline for the energy industry. The goal is to enable students to become aware of and gain interest in career opportunities in the industry while providing core skills that translate readily to sectors such as architecture, construction, and manufacturing. This will broaden students' options for post-secondary education and career pathways.

CASE staff participated with education and industry professionals in a series of meetings arranged by the Virginia Department of Education during the past year to assist in the development of the 17th Career Cluster. At these meetings, the myriad pathways through which students could enter the energy industry were identified, and the courses that would define the new curriculum were developed. CASE staff provided perspective and insight pertaining to renewable energy in particular, and aided in bringing renewable energy experts into the process to ensure that relevant topics and content were considered. The new career cluster, pathways, and courses were launched on July 1, 2020.



MAKING THE "CASE"

The Center for Wind Energy was re-named the Center for the Advancement of Sustainable Energy (CASE) in 2019. This re-branding reflects the broadening of scope of the center over several years to address (in addition to wind energy) solar power, energy efficiency, and energy storage.

The new center offered a new look and logo as well as a re-designed website now hosted on the JMU domain and organized to reflect the three key focus areas of CASE: Education and Training; Community Outreach; and Research and Deployment. The website is structured as well to consider the key audiences that we serve: students; educators; communities and small businesses; and industry, government, and utilities.

The launch of the new center coincided with CASE participating and presenting, for the first time, at the Virginia State Fair. There, our new logo was rolled out on promotional items such as sunglasses and wind turbine pens. Additional outreach materials for indoor and outdoor events were procured in preparation for future events.

JAMES MADISON UNIVERSITY MORE JMU Search JMU

ADMISSIONS ACADEMICS STUDENT LIFE VISIT TUITION & FINANCIAL AID ATHLETICS

Center for the Advancement of Sustainable Energy

CASE

- ABOUT CASE
- STUDENT OPPORTUNITIES
- EDUCATOR NETWORK
- COMMUNITY & SMALL BUSINESS
- INDUSTRY, GOVERNMENT, & UTILITY
- SUPPORT CASE
- JOIN OUR MAILING LIST

Total Generation 1019 Watts Total Site Power Currently Powering 1 Classrooms <small>(assuming 1000W per classroom)</small>	Hillside Solar Facility 792 Watts Solar Power	Small Wind Training & Testing Facility (SWTTF) 226 Watts Total Power 100 Watts Solar Power	126 Watts Wind Power 0.8 m/s (1.8 mph) Wind Speed & Direction
---	--	--	--

Hillside Solar Facility Small Wind Facility

How much renewable energy is being produced on campus? Find out right now thanks to our live... [READ MORE](#)

Education K-12 Student Education Teacher Professional Development Higher Education	Outreach Campus Engagement Local Engagement Regional Engagement	Research Collegiate Wind Competition Capstone Projects Sponsored Projects
--	---	---

Year In Review Highlights:

INAUGURAL VIRGINIA CLEAN ENERGY SUMMIT

The inaugural Virginia Clean Energy Summit highlighted the many different technologies that create opportunities for Virginia businesses while enabling a more reliable, responsive, and environmentally-friendly energy future. This one-day event featured keynotes, plenary panels, and breakout workshops on topics including solar power, energy efficiency, energy storage, electric vehicles, micro-grids, wind power, smart buildings, big data, policy, financial/business model innovations, and more. [Click here to view the presentations from the event.](#)

The goal of the Summit was to highlight opportunities and encourage collaborations that will advance greater energy efficiency; increased use of solar, wind, energy storage, and electric vehicles; and development of other clean energy solutions. Conference attendees represented businesses, state and local governments, academia, and NGOs.

CASE was proud to play a role in planning this important event. CASE staff and our Hospitality Management intern also assisted VA-REA in developing the structure of the event and planning sessions. CASE staff also generated an alumni database used to identify potential sponsors for the summit and new VA-REA members.



VIRGINIA CLEAN ENERGY SUMMIT

JMU ALUMNI NETWORK



One deliverable for the Virginia Clean Energy Summit was to develop a network of JMU Alumni active in the renewable energy field who might be inclined to sponsor the summit. As we progressed through this task, it became clear that CASE needed a comprehensive database that encompassed the full spectrum of alumni who have entered the clean energy industry so we could connect with them and connect them to each other. A LinkedIn group was developed that is used to engage the alumni network as a whole and to provide individual alumni the opportunity to engage each other.

EDUCATION & TRAINING

Given the increasing demand for a robust workforce to serve the renewable energy industry, it is important to engage with K-12 students and educators as well as college students to ensure that renewable energy concepts are taught at every level and that career opportunities are described.

CASE provides access, resources, and services to these key audiences by hosting campus visits, offering teacher workshops, supporting a kit library, and providing opportunities for students to engage in competitions to apply their renewable energy knowledge and engage in teaming.

Some of the key activities we offer are highlighted in the following showcases.



8,300

STUDENTS REACHED



297

EDUCATORS ENGAGED

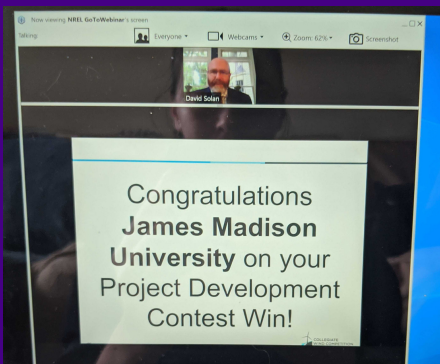
COLLEGIATE WIND COMPETITION



The Collegiate Wind Competition, sponsored by the U.S. Department of Energy, challenges interdisciplinary teams of undergraduate students at colleges and universities across the U.S. to develop unique solutions to complex wind energy problems, while gaining real-world experiences that enhance the ability of students to enter the wind industry workforce.

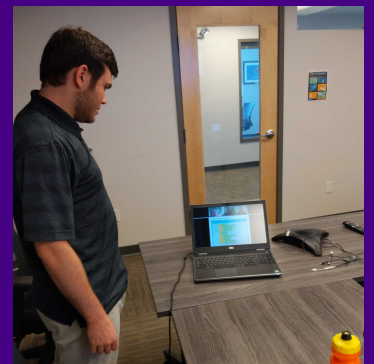
CASE staff worked with students and faculty at JMU to assist with their preparations to compete in the June 2020 Collegiate Wind Competition which took place virtually. The multidisciplinary nature of the competition enabled a diverse team of students representing a range of majors including Computer Science, Engineering, Geographic Science, Industrial Design, Integrated Science and Technology, Management, Media Arts, Physics, and Theater.

Although the competition was moved to a virtual platform due to the pandemic, the students persevered and took *first place* in the Project Development contest.



Left: Screen capture as it was announced that JMU won the Project Development contest during the 2020 CWC Awards Ceremony.

Right: Photo of JMU CWC '19 and CASE alum Zach Lasek (taken by JMU CWC '20 alum Colton Sorrells) as they watched the CWC Awards livestream from their office at Scout Clean Energy in Boulder, Colorado.



Education and Training Showcase:

EASTERN VIRGINIA WIND CHALLENGE

Prior to the pandemic, CASE was able to host only one of our seven planned challenge events. On March 12, 2020 we had 8 teams participating in the Eastern Regional Wind Challenge hosted at the Jamestown 4-H Center.

At that event, CASE also dedicated a new wind tunnel for the Eastern Virginia region that was purchased thanks to a sponsorship from Ørsted, with a keynote speech given by Mr. Hayes Framme. This tunnel is available to any participating team in the Eastern Virginia region to practice for future challenges.

Thirteen teams registered, but because of COVID travel restrictions many teams from Virginia Beach were not able to attend. Middle school teams were able to gain extra points by participating in a sail car instant challenge, and high school teams earned points by playing the game Windopoly. After a fun day of competition, two middle school teams and three high school teams received trophies.

In June 2020, CASE recognized Diane Painter of Makersmiths, Inc. in Leesburg as Coach of the Year. Although her team was unable to participate because of the challenge cancellations, she was still recognized because of the overwhelming support she provided her students as they prepared for the competition.

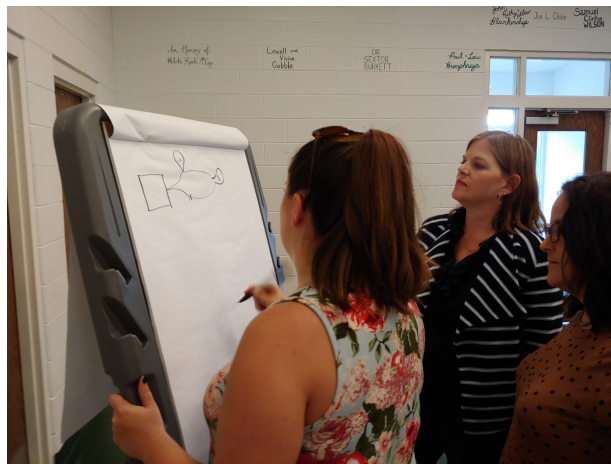


NEW SPONSORSHIP

During this challenge CASE dedicated a new wind tunnel for the Eastern Virginia region that was purchased thanks to a sponsorship from Ørsted, and will be housed at the Jamestown 4H Camp.



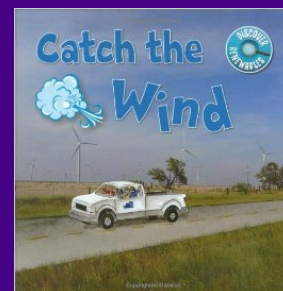
SATELLITE LENDING LIBRARY LOCATIONS



CASE worked to expand the **Lending Library** through a relationship with the 4H youth program in Virginia by bringing NEED wind and solar kits (broken down into activity kits) to all six 4H camps. In addition, CASE worked in the spring to develop activity videos of kits in our library to supplement virtual learning.

CASE offered training **workshops for educators** on the new NEED kits at the 4H centers to describe how they can be used to prepare teams for wind and solar challenges. Further, CASE participated with exhibitor booths and sessions at three teacher conferences in 2019-2020 to promote the suite of renewable energy education resources available to educators at CASE, and focused on the wind and solar challenges as culminating events.

NEED wind and solar kits paired with books



COMMUNITY OUTREACH

CASE engages the community at large, by conducting various forms of outreach and by hosting and participating in public events. During the past year, and in various ways, CASE engaged K-12 students, industry personnel, and other residential and commercial stakeholders.

In particular, CASE participated in both wind and solar energy conferences, sustainability events, the Harrisonburg Solar Home Tour, the Harrisonburg Sustainable Energy Fair, and much more!



20

COMMUNITY EVENTS



1058

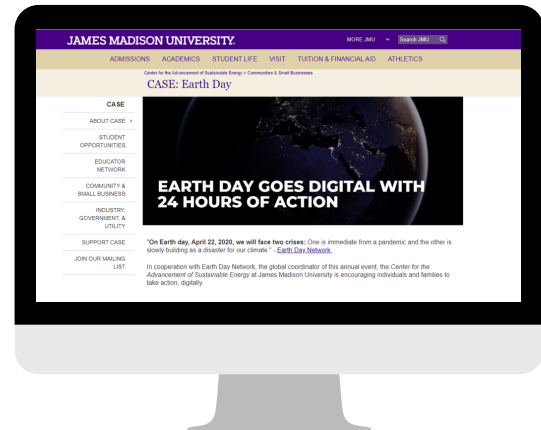
COMMUNITY MEMBERS
ENGAGED

LOCAL EVENTS



Harrisonburg Solar Home Tour

CASE organized and hosted the third annual Harrisonburg Solar Home Tour on Saturday, October 19, 2019. This event empowered and educated homeowners by presenting a collection of solar projects and stories in and around Harrisonburg. Attendees were able to learn from local solar industry experts as well as hear directly from their neighbors who have gone solar. The Harrisonburg Solar Home Tour saw 35 attendees, 11 vendors, volunteers, 4 speakers, and a multi-faceted electric vehicle display.



Digital Earth Day

Because of Covid-19 restrictions, CASE personnel re-directed our sustainable energy fair efforts. This led to an online event that conducted in coordination with the Earth Day Network, the global coordinator of Earth Day. Digital Earth Day efforts included developing virtual tools for event attendees to (1) assess their home energy consumption; (2) engage with solar professionals and request a first-order analysis, and (3) determine the economic viability of a potential wind project by requesting a wind analysis.

OCTOBER 19, 2019

46

SOLAR TOUR ATTENDEES

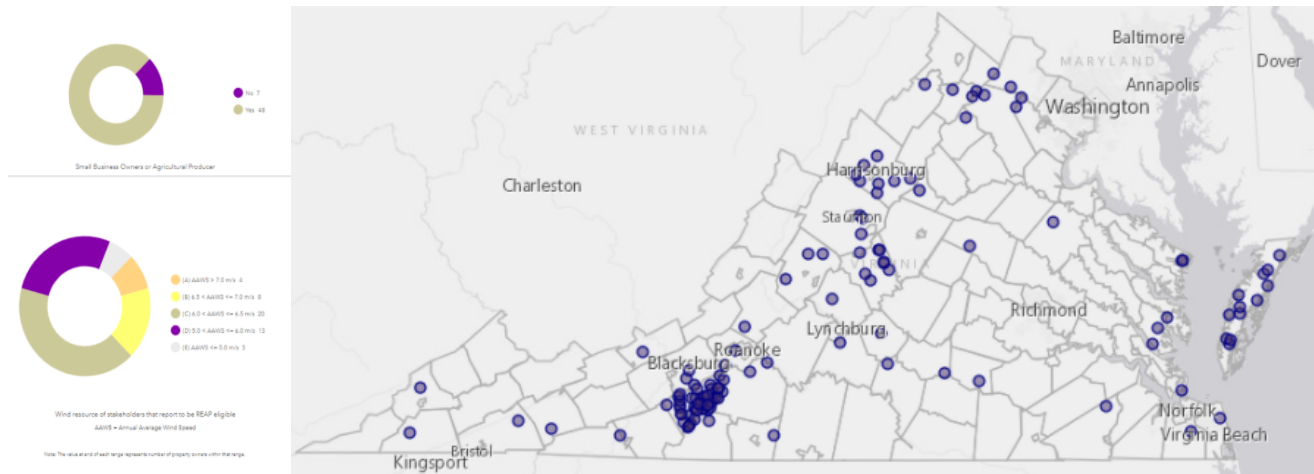
APRIL 2020

114

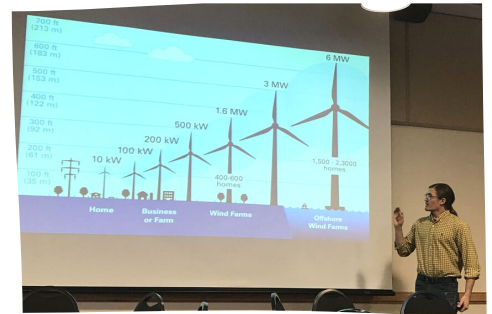
DIGITAL EVENT ATTENDEES

Community Outreach Showcase:

DISTRIBUTED WIND ASSISTANCE PROGRAM



CASE administers the Distributed Wind Assistance Program (DWAP) which leverages the stronger wind resources in regions of Virginia where they coincide with rural small businesses and agricultural producers. This program promotes the diversification of Virginia's power generation portfolio while simultaneously providing wind analysis reports that enable small businesses and agricultural producers to make informed decisions regarding the potential to generate power independently while also reducing electricity costs. Through our program outreach efforts and stakeholder engagement, CASE has identified dozens of business owners in Floyd County and surroundings to be prime candidates for Distributed Wind development.



WIND ANALYSIS REPORTS

147

PROGRAM CLIENTS

Community Outreach Showcase:

VIRGINIA STATE FAIR



Over the course of one week, CASE offered a wide array of workshops and educational materials for K-12 students at the Virginia State Fair, to ensure that sustainable energy was represented at the Conservation Classroom and Natural Resource event areas. CASE also participated at an exhibitor booth in between children workshops in order to engage other State Fair attendees.

**SUSTAINABLE ENERGY
WORKSHOPS**

225

ATTENDEES ENGAGED

RESEARCH & DEVELOPMENT

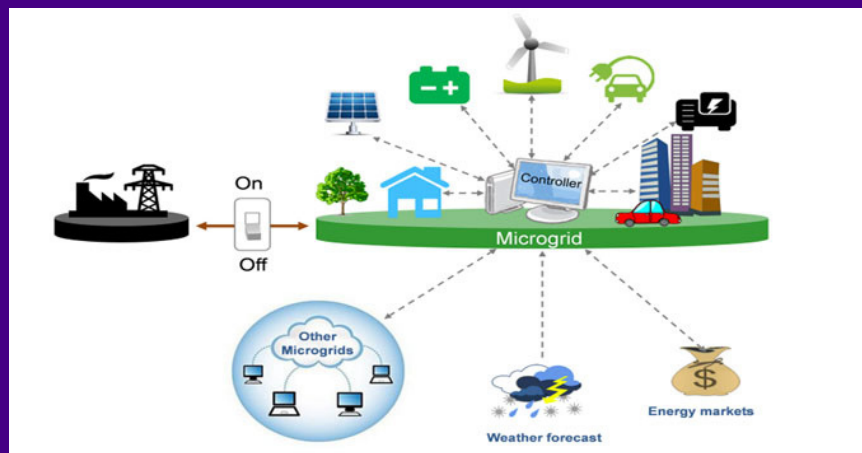
CASE wears multiple hats as we address *Education & Training*, and *Community Outreach*, as well as *Research & Development*, which are more traditional areas of activity for an academic center. Our faculty and students engage in funded projects on behalf of sponsors from government, industry, and private foundations, and many of these projects provide the basis for student capstones (that earn academic credit), summer internships, and posters and publications that are presented at conferences and in print. The outcomes of such projects often provide direct benefits to the university, to local communities, and of course to the sponsors who support them. We strive especially to develop projects that facilitate the adoption and deployment of clean energy, and which foster the opportunity for students at all levels, from K-12 to college, to gain experience in this field.



TANGIER ISLAND STUDIES



Tangier Island in the Chesapeake Bay is home to around 450 Virginia residents, it is a remote island community of significant cultural and historical significance, one populated by some of the most skilled watermen in the region. Tangier Island has also served as the focus of several state-funded studies over the past two decades that examined the feasibility of bringing clean electric power to such communities that are at risk due to climate change and associated sea-level rise. Our studies have included the deployment of a 50-meter meteorological tower (pictured above) to collect wind speed and direction data that have demonstrated that it may be possible to power Tangier and neighboring Smith Island exclusively with wind and solar power, thus enable these two communities to become energy-independent. CASE is currently collaborating with two state agencies and several other parties in an effort to advance development of a wind- and solar-powered microgrid to enable the Tangier and Smith Island communities to self-power in a carbon-free manner.



JMU CAMPUS ENERGY ANALYSIS

In 2019, Professor Jonathan Miles partnered with JMU professors Steve Grande and Maria Papadakis to form a Clean Energy Taskforce. This taskforce was charged by university administration to summarize JMU's current policies, practices, initiatives, and behaviors related to clean energy; to examine and document best practices at other higher education institutions in the U.S. with a particular focus on other public higher education institutions in Virginia; and to identify opportunities for advancing clean energy progress at JMU, while taking into consideration costs, benefits, and risks both initially and over the lifetime of any potential project or activity. The team conducted a strategic evaluation and developed recommendations for forging a path forward toward greener university energy consumption. The team highlighted relevant state-of-the-art and best practices at other Virginia universities, and discussed the opportunities, challenges, and options for JMU to reduce meaningfully its energy-related greenhouse gas (GHG) emissions. A final report was structured around three main strategies: **Demand Reduction** by decreasing the amount of energy used to meet needs; **Supply Reduction** by replacing fossil fuels with lower-carbon alternatives, and **Emission Offsets** by capturing or preventing GHG emission in a way that can be credited to an institution and reduce its overall GHG footprint.



Research & Development Showcase:

SENIOR CAPSTONES

Our executive director, Dr. Jonathan Miles, began his career at JMU nearly twenty-five years ago as an assistant professor of Integrated Science and Technology (ISAT). As a faculty member, he has taught courses in applied calculus and physics, instrumentation and measurement, energy at all undergraduate levels, and to graduate students enrolled in a dual-degree sustainability master's program that he co-founded and directed from 2009-2014. The ISAT major is by design interdisciplinary, a defining characteristic of which is the senior capstone project that students define during their junior year and execute as seniors. Dr. Miles and several of his faculty colleagues serve as faculty advisor each year on senior capstones that address clean energy in myriad ways.

The titles of several recent capstones are presented below:

- The Effect of Soiling on Solar Photovoltaic Panel Efficiency
- Energy Modeling & Design of Prototype Hydroponic Grow System
- Sustainable Living Design: Affordable & Efficient Living in a Self-Constructed Tiny House
- Project Management and Support of James Madison University's 2018 Collegiate Wind Competition Team





CENTER *for the*
ADVANCEMENT *of*
SUSTAINABLE ENERGY
JAMES MADISON UNIVERSITY.



Jonathan J. Miles, PhD
Executive Director, Research Manager



Remy Pangle
Managing Director, Education Manager



Dustyn Vallies
Outreach & Deployment Manager



Grace Mauro
Communications & Events Manager

Thank you to our supporters



**CENTER FOR THE ADVANCEMENT OF SUSTAINABLE ENERGY
AT JAMES MADISON UNIVERSITY**

1401 Technology Drive
Suite 120
MSC 4905
Harrisonburg, Virginia 22807

Office: 540.568.8768
case@jmu.edu
www.jmu.edu/case