



Course Name: Introduction to Renewable Energy

Lead Faculty: **Ken Walz**

School: **Madison Area Technical College**

Delivery Mode(s) for Intro to RE Course (i.e. face-to-face, online, hybrid, etc): **Online**

Course Duration (semester, trimester, quarter, short-course, etc.) **Semester (15 weeks)**

of credits for the Intro to RE course **3**

Program Name: **Renewable Energy**

When did the program start? **2005**

What geographic area do your students come from? **Mostly from south central Wisconsin. However, since several of our classes are available online, we have had students from all 50 states as well as several international students who access our courses from abroad.**

Number of Students in Program: **We had 44 students enrolled in renewable energy coursework as of Spring 2017. Typical class sizes range between 12 and 17.**

Demographics: Percentage distribution

Note: Numbers are reported as College as a whole, and for the RE Program (estimated in parentheses).

Gender	Male: 45% (70%)
	Female: 55% (30%)
Ethnicity:	White: 72% (80%)
	Other/Mixed Race: 14% (10%)
	Hispanic: 8% (8%)
	Black: 6% (2%)

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Veterans: **2.5% (2.5%)**

Average Age: **29 (24)**

Degree(s)/ Diplomas(s) / Certificate(s) Offered:

Renewable Energy Certificate, Wind Energy Certificate, and Solar Energy Certificate

How Many Faculty teach renewable energy courses at your college (note if FT or PT)?

Three full time (myself, Joel Shoemaker, and Cris Folk). We also have a group of about 4 adjunct faculty who have teach with us part time on an as needed basis.

Description of Your Facilities (be sure to note any special lab facilities used for hands-on training):

Over the past decade, Madison College has invested substantial resources in the creation of a photovoltaic teaching facility on our campus. The outdoor PV yard includes two mock roof structures of varying pitch, two ground mount locations that simulate flat roof conditions, and two pole mount structures for hands-on instruction in PV installation techniques. The systems are composed of monocrystalline silicon PV modules combined with either a single grid-tied string inverter or multiple microinverters assigned to individual modules. The six systems have a total capacity of approximately 10kW. The facility includes all of the necessary hardware, conduit runs, and balance of system electronics to provide for complete hands-on assembly of full scale PV systems. The facility was designed in consultation with our local utility, Madison Gas and Electric, to provide model examples for grid-connected PV systems, and can be used to teach not only installation, but also proper commissioning, de-commissioning, and inspection and troubleshooting procedures.

Madison College also operates a unique 1.0 kW building integrated photovoltaic (BIPV) system. The BIPV system is integrated into the glass roof structure of a school bus stop, and the balance of system components are all located at ground level and are easily visible and accessible for student instruction. Madison College also has two charging stations for plug-in electric vehicles, and is in the process of adding batteries and DC charge controllers to several of the PV systems in order to familiarize students with the functionality, safety concerns and installation requirements of systems that incorporate energy storage. The college is currently in the design and planning process to create a 1.4 MW solar photovoltaic array on the roof of the main building at the flagship Truax

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campus. The system will be completed in 2018, at which time it will be the largest rooftop PV system, and the largest educational PV system, in the State of Wisconsin.

Madison College operates a Northwind 100kW turbine mounted on a 100 foot monopole tower that is used to teach climbing safety as well as wind turbine maintenance. Two smaller Vestas 55kW turbines were recently donated to the college, and will be installed on lattice towers in the upcoming year. The college also owns two smaller 1kW turbines that can be installed on tilt up towers using screw anchors suitable for locations that lack a permanent concrete footing for the tower base. These turbines are used for teaching wind installation field workshops, for conducting wind site assessments at locations being considered for larger turbine installations, and to demonstrate integration with solar arrays in hybrid system configurations.

The Madison College Diesel and Heavy Equipment Laboratory includes a 50 gallon pilot scale biodiesel reactor, engine dynamometer, vehicle service bays, mechanic benches and access to over 40 vehicles and 100 stationary test engines. Fuel diagnostic equipment includes instruments for measuring viscosity, flash point, pour point, cloud point, water content, oxidative stability, corrosion, etc. Madison College also has a natural gas fueling unit for CNG fueled vehicles, and students recently constructed a small scale anaerobic digester that is the subject of ongoing feasibility studies to assess the potential for recapturing campus food waste for the production of methane biogas.

Have you conducted a job market assessment? If yes, what were the findings?

Madison College worked with our Industry Advisory Board to complete a renewable energy job market assessment in 2016. In the past 5 years, Madison College Renewable Energy alumni responding to tracking surveys reported working in positions with employers including: Brown Dog Gadgets, City of Madison, Faith Technologies, Full Spectrum Solar, Iowa Wind and Solar, Kettle View Wind and Solar, Organic Valley, Rocky Mountain Wind and Sun, Sun Peak, Sun Vest, Vestas, and Wes Engineering. Earnings ranged from \$13.82 (10th percentile) to \$32.01 (90th percentile), with a median wage of \$22.35 per hour.

In the past 12 months RE faculty have also been contacted by numerous employers seeking our students for employment. These included the following:

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Employer	Position Type
City of Madison	Solar Installers (multiple positions)
Dane Co Community Biogas Digester	Biogas System Operators (multiple positions)
Full Spectrum Solar	Solar Installer
H&H Electric	Solar Technician
Kettle View Renewable Energy	Solar Technicians
Sun Peak	Solar Design and Sales (multiple positions)
Sun Run	Solar Design and Sales (multiple positions)
Vestas	Wind Technicians (multiple positions)
Wes Engineering	Wind and Bio Energy Technicians

The job market assessment included an employer survey to gauge future workforce needs. Highlighted questions from the employer survey included:

Q: When hiring a new employee, rank the value of each of these Madison College academic credentials? (High = 3, Med=2, Low=1, No Value = 0 or NA)

Academic Credential	Weighted Average
Electrician Apprentice Program - 5yr	2.36
Photovoltaics Certificate - 1yr	2.33
Industrial Maintenance Electrician Apprentice Program - 4yr	2.09
Industrial Maintenance Technician diploma - 2yr	1.91
Electrical Engineering Technology Associates Degree - 2yr	1.85
Renewable Energy Certificate - 1yr	1.83
Electronics Technician Associates Degree - 2yr	1.77
Wind Energy Certificate - 1yr	1.5
Industrial Maintenance Mechanic diploma - 1yr	1.33

CONCLUSION: Employers value the RE certificates as much as, or more than, other Madison College diploma and degree programs.

Q: Are there specific types of positions that are in high demand at your business/organization?

Top Responses = Electricians, Electrical workers, PV/Solar Installer, Maintenance technicians, Mechanical technicians, Automation and controls, Building maintenance

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Q: Please estimate the number of renewable energy technicians that your firm or organization expects to hire in the next 1-3 years:

Of the 13 respondents who answered this question, there were a total of 88 positions estimated.

What do you think makes your program successful?

The Renewable Energy Certificates at Madison college are designed to complement education or work experience in traditional related fields such as construction trades, architecture, electronics, industrial maintenance, and various fields of engineering. Students pursuing Associate Degrees in these traditional fields can earn a Renewable Energy Certificate to further their education, thereby giving them an added distinction when seeking employment. Students seeking to transfer to complete four year degrees in STEM fields can earn the Renewable Energy Certificate while incorporating practical applications into their undergraduate degree. Likewise, individuals who are already gainfully employed in traditional fields can complete a certificate to expand their skill set to include Renewable Energy technology in their portfolio of expertise. As a result, the Renewable Energy program at Madison College appeals to a wide cross-section of students. This diversity of work experience and career goals makes for a rich learning experience in the classroom. Several of our courses are offered online, or in hybrid formats, and some are also offered as 2 or 3 day short-courses. These flexible formats are helpful to students with family and work obligations, who otherwise may not be able to attend school on a full-time basis.

What are your industry ties? (If you have an industry advisory board, please describe its size and composition).

The Madison College Renewable Energy Industry Advisory Board (IAB) includes roughly 50 members from the community, plus an additional 6-10 representatives from various areas of the college. IAB members include representatives primarily from the solar, wind, and bioenergy sectors. We also have representatives from both investor owned and publically owned electrical utilities, from state agencies and regulatory bodies, from municipal government, and from the University of Wisconsin scientific research community.

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Do you offer internships? What is your placement rate?

Internships are not a formal part of our program. However, some students have pursued and completed internships with local employers, independently from the requirements of their academic program.

Program Link : <https://madisoncollege.edu/program/renewable-energy>

Any additional information you would like to provide:

Madison College is pleased to offer a Solar PV Institute for Educators each summer. We invite any interested teachers to join us in the upcoming year to get some hands-on experience working with our PV lab facilities and interacting with our instructors and students.

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