



NC CLEAN ENERGY TECHNOLOGY CENTER

Training Course Information 2019 – 2020



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NCCETC MISSION & INTRODUCTION

The N.C. Clean Energy Technology Center (NCCETC) is a UNC System-chartered Public Service Center administered by the College of Engineering at North Carolina State University.

Its mission is to advance a sustainable energy economy by educating, demonstrating and providing support for clean energy technologies, practices, and policies.

The Center provides service to the businesses and citizens of North Carolina and beyond relating to the development and adoption of clean energy technologies. Through its programs and activities, the Center envisions and seeks to promote the development and use clean energy in ways that stimulate a sustainable economy while reducing dependence on foreign sources of energy, and mitigating the environmental impacts of fossil fuel use.

Since its founding as the North Carolina Solar Center in December 1987, the Center has worked closely with partners in government, industry, academia, and the non-profit community while evolving to include a greater geographic scope and array of clean energy technologies. As a result of this evolution, the Center has grown into a state agency respected for its assistance to the burgeoning “clean tech” sector in North Carolina, as well as one of the premier clean energy centers of knowledge in the United States.

NCCETC currently manages a diverse group of projects, including the U.S. DOE-supported Southeast Regional Combined Heat and Power Technical Assistance Program, the Database of State Incentives for Renewables and Efficiency (DSIRE), and the federally supported Clean Fuel/Advanced Technology project sponsored by the U.S. Federal Highways Administration and the N.C. Department of Transportation.

TRAINING PROGRAM HISTORY & INFORMATION

NCCETC has been providing quality training through classroom, online, and hands-on delivery methods to thousands of students and professionals since 2004. The Center is registered as a North American Board of Certified Energy Practitioners (NABCEP) Continuing Education Provider and a Photovoltaic (PV) Associate Provider. Training classes are evaluated and approved to provide continuing education credits for organizations such as the American Institute of Architects, Building Performance Institute (BPI), NC State Board of Examiners of Electrical Contractors, and the NC Department of Insurance among others.

Through the Center's training programs, participants are able to begin their careers as a certified NABCEP PV Associate, continue their technical education with more advanced classes such as operations and maintenance, or develop their project management skills through Certificate in Renewable Energy Management (CREM). Many students opt to take multiple classes through the unique Renewable Energy Technologies Diploma Series (RETDS), a 120-hour continuing education program geared towards anyone entering the industry and provides a support network for those looking to expand their careers to include installation, distribution, production, sales, and marketing of sustainable energy technologies.

EXTERNAL LICENSING ORGANIZATIONS

NORTH AMERICAN BOARD OF CERTIFIED ENERGY PRACTITIONERS (NABCEP)

The NCCETC is a NABCEP Photovoltaic Associate Registered Training Provider and a NABCEP Registered Training Provider for Advanced-level Training.

The North American Board of Certified Energy Practitioners® (NABCEP®) is the most respected, well-established and widely recognized national certification organization for professionals in the field of renewable energy.

NABCEP is committed to providing credential programs of quality and integrity for the professionals and the consumers/public it is designed to serve. NABCEP's programs are administered to the highest standards for certifications and testing. The NABCEP PV Installation Professional and Solar Heating Installer Certifications are accredited to the ISO/IEC 17024 standard by the American National Standards Institute (ANSI).

Education and training are integral to all stages of earning and maintaining NABCEP Credentials. NABCEP Credentials require proof of training hours to qualify to sit for an exam. NABCEP registers quality, affordable training courses listed in the NABCEP Course Catalog. Associate Program courses include basic, fundamental concepts relating to the NABCEP Job Task Analysis or Learning Objectives. All other registered training must offer advanced-level courses that enhance the professional knowledge and skills of a NABCEP Board Certified Professional.

BUILDING PERFORMANCE INSTITUTE, INC. (BPI)

The NCCETC is a BPI Continuing Education Units (CEU) Provider.

Many of the 130 million homes in this country were constructed before energy and building codes were established. These homes often suffer from performance problems ranging from energy consumption to poor thermal comfort to indoor air quality issues.

In response to these issues, the Building Performance Institute, Inc. (BPI) was founded in 1993. BPI has become the nation's premier standards development and credentialing organization for residential energy auditing and upgrade work. BPI is a 501(c)(3) nonprofit organization.

BPI is accredited by the American National Standards Institute, Inc. (ANSI) as a developer of American National Standards and by the ANSI National Accreditation Board under ISO/IEC 17024 as a certifying body for the Energy Auditor professional certification.

CEU Providers help BPI Certified Professionals maintain the highest level of quality and professionalism and get CEUs to recertify.

RESIDENTIAL ENERGY SERVICES NETWORK (RESNET)

The NCCETC partners with RESNET Accredited Provider EverBlue to deliver the RESNET HERS Rater training.

The Residential Energy Services Network or RESNET is a not-for-profit, membership corporation that is governed by a board of directors (who are elected by membership).

In April 1995, the National Association of State Energy Officials and Energy Rated Homes of America founded the Residential Energy Services Network (RESNET) to develop a national market for home energy rating systems and energy efficient mortgages.

RESNET is a recognized national standards-making body for building energy efficiency rating and certification systems in the United States involving:

- A consensus based standard development and amendment process
- Transparent review and adoption process
- Formal public review and comment process

RESNET created and maintains:

- The HERS Index to allow for easy comparison of energy performance of homes
- The HERS H2O rating to compare indoor and outdoor water usage of homes
- National training and certification and quality assurance standards for Home Energy Raters
- Two American National Standards Institute (ANSI) Standards supporting energy and water efficiency in homes
- Four Standard Development Committees

AMERICAN INSTITUTE OF ARCHITECTS (AIA)

The NCCETC is an AIA Continuing Education Provider.

The American Institute of Architects (AIA) works to advance our nation's quality of life and protect the public's health, safety and welfare, as it has done for 160 years.

AIA advocates for the value of architecture and gives architects the resources they need to do their best work. AIA's work drives positive change through the power of design.

To support the demand for quality continuing education across a wide domain of topics and delivery modalities, AIA established the Continuing Education Services (CES) program in 1995. The AIA CES program leverages a network of providers to design,

develop, deliver, and administer high-quality, relevant learning programs to satisfy AIA requirements for continuing education related to the field of architecture and architectural practice as well as the mandatory continuing education requirements for state license registration and renewal.

All AIA CES learning programs must be reviewed and approved by AIA CES prior to being delivered for AIA continuing education credit.

GREEN BUSINESS CERTIFICATION, INC. (GBCI)

The NCCETC is a GBCI approved continuing education provider.

Green Business Certification Inc. (GBCI) is the premier organization independently recognizing excellence in green business industry performance and practice globally.

GBCI is comprised of 140+ staff experts and 600 consultants apportioned into three teams that form a paramount organization through certification, credentialing and customer support. With locations in the U.S., Europe, India, China and Mexico GBCI supports project teams and professionals in over 160 countries.

GBCI provides third party verification services for certification and credentialing through a scientific process by which a product, process or service is reviewed by a reputable and unbiased third party to verify that a set of criteria, claims or standards are being met. Certification and credentialing is used within the global green building industry to demonstrate credibility, provide a metric for comparisons and add significant value.

GBCI administers the LEED certification program through the U.S. Green Building Council (USGBC), performing third-party technical reviews and verification of registered projects to determine if they have met the standards set forth by the LEED rating system. Dedicated technical experts ensure building certification meets the highest levels of quality and integrity.

GBCI develops and administers the ANSI-accredited LEED professional credential exams, which include the LEED Green Associate and LEED AP with specialty credentials.

PROGRAM STAFF AND INSTRUCTORS

MEGAN BERRY

SENIOR TRAINING SPECIALIST

Megan Berry is a Senior Training Specialist for the Center, where she manages the Renewable Energy Technology Diploma Series training program, customized trainings, and other workforce development opportunities. Megan has been with the Center since 2017 and has been involved in the environmental sustainability field since 2007.

After graduating from NC State in 2011, she became an Energy Fellow and Program Coordinator for the NC State University Sustainability Office until 2013, working on ways to more actively engage students with sustainability on campus. From 2013-2015, Megan served as a Peace Corps Volunteer in Panama, working on school and community environmental outreach programs. After returning from Panama, she moved to Lancaster, UK to begin graduate school. While in Lancaster, she was the Communications and Engagement Supervisor for Green Lancaster, an environmental behavior change organization on campus. After submitting her dissertation about grassroots efforts versus infrastructural changes related to sustainability practices in Higher Education Institutions, Megan received her MA in Environment, Culture, and Society from Lancaster University in 2016. She also has her B.S. in Environmental Technology and Management from NC State University, received in 2011.

DAVID DEL VECCHIO

SOLAR INSTRUCTOR

David Del Vecchio has 20 years of design, installation, and maintenance experience in the photovoltaics industry. He earned a Bachelor of Mechanical Engineering with Honors from the Georgia Institute of Technology in 1992. He began installing photovoltaics in 1998. He has designed and installed all types of photovoltaic systems from off-grid, stand-alone solar/wind/hydro hybrid systems to straight grid-tied systems with and without batteries.

David is a premiere PV trainer in NC, currently teaching for the NCCETC (12 years) and for Solar Energy International (10 years) based in Colorado. Having taught thousands of students, his positive impact on the industry is widespread. He also leads courses at solar conferences such as Solar Power Int'l and InterSolar San Francisco. From October 2011 through February 2014, David was employed as the Senior Engineer for Strata Solar in Chapel Hill which saw a growth of 2400%. His work involved quality assurance for PV design and equipment specifications, installation oversight, commissioning and O&M for 250MW of utility-scale PV power production facilities.

David became certified by the North American Board of Certified Energy Practitioners (NABCEP) as a Certified PV Installer in 2005, the first and longest held in North Carolina. David was a certified IREC Master Trainer in PV from 2010-2017. He also started the PV training program at Central Carolina Community College in Pittsboro, NC. Since 2006, David is President of Solar Seed, Inc., a consulting/design company assisting in bringing PV projects from concept through design drawings to installation, commissioning, and operations and maintenance. He has also trains O&M crews for utility companies and private businesses. David is a lead consultant for SEI Professional Services, providing technical support/design review/inspections for rooftop and ground mounted, commercial, industrial, and utility scale PV installations. He lives off-grid in Pittsboro, NC.

REBEKAH HREN

SOLAR INSTRUCTOR

Rebekah Hren is a North Carolina licensed electrical contractor, NABCEP Board Member and Certified PV Installation Professional, and a Principal on Code-Making Panel 4 of the National Electrical Code (NFPA 70). Rebekah has taught PV design, and installation classes since 2007. She has been involved with the construction of over 150 megawatts of solar PV, working as a system designer and owner's representative for large-scale solar PV systems since 2009. Prior to 2009 she designed and installed residential-scale PV systems. Rebekah has co-authored two renewable energy books: "A Solar Buyer's Guide" and "The Carbon-Free Home", and writes technical articles for PV trade magazines including SolarPro and Home Power.

CERTIFICATE IN RENEWABLE ENERGY MANAGEMENT

INSTRUCTORS

Instructors for the Certificate in Renewable Energy Management course include industry professionals with a direct connection to renewable energy business, policy, finance, and project management. Current instructors represent organizations such as Duke Energy, Pike Electric, NC Utilities Commission, Southeastern Wind Coalition, Southern Energy Management, Self-Help Credit Union, and more.

TRAINING FACILITIES

TRAINING SITE

NCCETC's Training Site features a 28' x 48' 4/12 pitch training roof with residential roof shingles, guard rails wrapping around the back and sides, easy walk up from the ground, and drainage gutters on bottom of roof. The roof will support the weight of 25 adults at one time and the weight of a 5KW PV system. Underneath the roof there are three electrical work stations that hook up to grid power. Each station has mounting stations that can accommodate inverters, AC and DC disconnects, combiner boxes, main panel and utility meters.

MOBILE TRAINING UNIT

NCCETC's Mobile Training Unit is outfitted with a fully integrated grid-tied PV system and a battery-based PV system complete with AC and DC disconnects, charge controller, meters, and inverters. The mock roof is mounted onto a 23' double axle trailer that can be pulled by a 2.5 ton diesel truck. It is about 20' in length, 8' wide and 2.10' in height. Participants can work on the mock roof. Electrical components are mounted on the back of the roof during training. All components are stored under the roof. The full height of the system is less than 5' to comply with fall hazards.

HOUSE OF PRESSURE

NCCETC owns a House of Pressure, a nationally recognized prop used to visually demonstrate home performance testing using pressure diagnostics. Combustion appliance zone (CAZ) testing can be demonstrated, as well as blower door and zonal testing, among many others. Made of clear lexan (high strength plastic laminate), the interior of the House of Pressure is visible through all four walls. It has an operable forced-air duct system, dryer, bathroom fan, and fireplace. There are also smoke generators for the fireplace, water heater, and car exhaust.

BLOWER DOOR TEST

NCCETC also owns a blower door, a machine used to measure the airtightness of buildings. It can also be used to measure airflow between building zones, to test ductwork airtightness and to help physically locate air leakage sites in the building envelope. Blower door tests are used by building researchers, weatherization crews, home performance contractors, home energy auditors, and others in efforts to assess the construction quality of the building envelope, locate air leakage pathways, assess how much ventilation is supplied by the air leakage, assess the energy losses resulting from that air leakage, determine if the building is too tight or too loose, determine if the building needs mechanical ventilation and to assess compliance with building performance standards

TRAINING CLASSROOM

NCCETC's Training Classroom can hold a capacity of 40 people with tables, chairs, and a refreshment station. The classroom also has a large whiteboard and a new, 70' LED monitor to display presentations, websites, and other web materials.

MOODLE ONLINE PLATFORM

Moodle is the N.C. State University portal for online courses. NCCETC currently delivers many trainings through Moodle and would be able to easily create a new course site if it's determined that online training would be beneficial for the project.

TECHNICAL EQUIPMENT

Technical Equipment to film live sessions for online trainings can be completed through the use of NCCETC's DSLR camera, microphones, recording equipment, and live streaming equipment. N.C. State University also houses many virtual learning classrooms to use for the purpose of recording lectures and presentations.

TRAINING COURSES OVERVIEW

REPV: FUNDAMENTALS OF PV DESIGN AND INSTALLATION

This course, focusing on solar PV design and installation fundamentals, takes place over 5 days with 8 hours of instruction per day. The first four days are cumulative technical theory in a classroom format with the last day focusing on hands-on learning through the design and installation of a fully integrated, grid-tied, residential PV

This course is based on NABCEP's PV Associate Job Task Analysis and qualifies participants to sit for the NABCEP PV Associate Exam.

REPVO: ONLINE FUNDAMENTALS OF PV DESIGN AND INSTALLATION

This 40-hour, 6-week online course covers the same information as the in-person REPV class through pre-recorded lectures, assignments, and quizzes housed on an online platform. An optional hands-on day installing a fully integrated grid-tied PV system pulls together the classroom knowledge and rounds out the workshop.

This course is based on NABCEP's PV Associate Job Task Analysis and qualifies participants to sit for the NABCEP PV Associate Exam.

REPVA: ADVANCED PV DESIGN AND INSTALLATION

This advanced photovoltaics class covers advanced topics on design and installation of residential and commercial PV systems. This course delves into the details of electrical standards and codes. The bulk of this week-long workshop covers topics relating to the National Electrical Code® (NEC) requirements for PV systems and prepares the participant for proper code compliance, wire sizing, equipment specifications, permit processing, commissioning, and other necessary steps in the design and installation phases of residential and commercial systems.

REPVA ONLINE: ONLINE ADVANCED PV DESIGN AND INSTALLATION

This 40-hour, 6-week online course covers the same information as the in-person REPVA class through pre-recorded lectures, assignments, and quizzes housed on an online platform.

SOLAR STORAGE

This three-day onsite workshop will cover fundamental principles of battery based systems. At the end of the class, participants will be able to assist in designing and installing a residential PV system with battery back-up.

O&M: OPERATIONS AND MAINTENANCE OF PV SYSTEMS

This two-day workshop held in Raleigh, NC will cover evaluating performance of systems, including specific data collection and evaluation, as well as protocols for collection; arc flash requirements; finding ground faults; thermal imaging; IV curve tracing; and fuse servicing.

ONE DAY PV LAB

Held in Raleigh, NC, this day-long session is for those who have taken the 40-hour REPV online workshop or simply wish to gain more hands-on experience. This hands-on day begins with an overview of safety, system components, system design, and solar fundamentals. During the course of the workshop you will be filling out “balance-of-system” worksheets to ensure you understand sound PV system design practices. You will also be installing a live, grid-tied PV system, from mounting the modules, to wiring the inverter, and finally, to commissioning the system.

CREM: CERTIFICATE IN RENEWABLE ENERGY MANAGEMENT

This 40-hour program covers renewable energy technology applications and solar fundamentals (with an eye towards the business side of it), policies that create the market to better help you select that perfect project site, and how to finance and manage a renewable project.

BPI BUILDING ANALYST

A BPI Building Analyst Professional is a person who evaluates uncontrolled air leakage into and out of a home and identifies heating and cooling problems that lead to high energy costs, health problems, and occupant discomfort.

Delivered through a partnership with Everblue, the BPI Building Analyst certification course is aligned with the Building Performance Institute's (BPI) standards for home energy auditing and teaches you how to use building science to diagnose a home's energy issues. This training is offered online or in-person.

RESNET HERS RATER

Provided in partnership with NCCETC, Everblue's RESNET HERS Rater Training + Testing program will provide individuals with the knowledge necessary to provide homeowners and home builders a detailed analysis of energy consumption and options to save money by conserving energy. This course will teach you how to help builders and architects improve home energy efficiency and provides instruction for energy efficiency analysis using the house-as-a-system approach.

PRICING INFORMATION

SINGLE COURSE PRICING

REPV: Fundamentals of PV Design and Installation	\$1,199
REPVO: Online Fundamentals	\$1,099
REPVA: Advanced PV Design and Installation	\$1,499
REPVA Online	\$1,199
Solar Storage	\$799
CREM	\$1,998
O&M: Operations and Maintenance of PV Systems	\$699
BPI Building Analyst	\$1,799
RESNET HERS Rater	\$1,899
Customized Training Program	Price Varies

COURSE PACKAGE PRICING

NABCEP Education Package: REPV + REPVA	\$2,198
NABCEP Online Education Package: REPVO + REPVA Online	\$1,598
PV Technician Package: REPV + REPVA + O&M + Solar Storage	\$3,496
Solar Project Management Package: CREM + REPV + REPVA	\$3,896

PAYMENT PLANS

Payment plans ranging from 3 – 5 monthly payments are available for most courses and all packages. Contact Megan Berry at mdcain@ncsu.edu with specific questions.

2020 ACADEMIC CALENDAR

SPRING 2020

REPV: Fundamentals of PV Design and Installation	April 6 – April 10
REPVO: Online Fundamentals	January 27 – March 6
REPVA Online	April 20 – May 29
Solar Storage	June 29 – July 1
CREM	February 24 – April 3
O&M: Operations and Maintenance of PV Systems	June 11 - 12
BPI Building Analyst	On-Demand
RESNET HERS Rater	On-Demand

FALL 2020

REPV: Fundamentals of PV Design and Installation	September 28 – October 2
REPVO: Online Fundamentals	August 24 – October 1
REPVA	October 12 - 16
Solar Storage	November 16 - 18
CREM	July 13 – August 21
O&M: Operations and Maintenance of PV Systems	November 5 - 6
BPI Building Analyst	On-Demand
RESNET HERS Rater	On-Demand

PROGRAM POLICIES

CONDUCT & DISMISSAL

All students at North Carolina State University (NC State) are responsible for conducting themselves in a manner that helps enhance an environment of learning in which the rights, dignity, worth, and freedom of each member of the academic community are respected. Violations of campus or University policies, rules or regulations, or federal, state, or local law may result in a violation of the Code of Student Conduct and imposition of sanctions.

This Code of Student Conduct (Code) establishes the expectations for student conduct in the university community. The Code, therefore, proscribes the types of behavior that adversely affects the university community, and the resulting actions that may be taken to both educate students about behavioral expectations and to protect NC State's community. This Code and its accompanying regulation, NCSU REG 11.35.02 ([Student Discipline Procedures](#)) describe the process to be followed when a student has been charged with a violation of the Code.

NC State embraces and strives to uphold the freedoms of expression and speech guaranteed by the First Amendment of the U.S. Constitution and the North Carolina Constitution. The university has the right under certain circumstances to regulate the time, place, and manner of exercising these and other constitutionally protected rights.

REFUNDS

In the event you need to cancel one class, the following options are available:

- Substitute a colleague for the whole program with no charge or penalty
- Attend next scheduled class for no penalty or additional fee
- Cancel 14+ days before workshop - 95% refund
- Cancel 7-14 days before workshop - 50% refund
- Cancel 1-7 days before workshop - 25% refund
- Cancel first day of class or later - no refund

TRANSFER CREDITS

Previous courses at other institutions may be counted towards the 120 hours needed for the Renewable Energy Technologies Diploma Series or as a prerequisite fulfillment for advanced courses. This will be evaluated on a case by case basis by the Training Program staff. Proof of attendance, such as a certificate of completion, is required.

STUDENTS WITH DISABILITIES

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Disability Resource Office at Holmes Hall, Suite 304, 2751 Cates Avenue, Campus Box 7509, 919-515-7653. For more information on NC State's policy on working with students with disabilities, please see the [Academic Accommodations for Students with Disabilities Regulation \(REG02.20.01\)](#)

NON-DISCRIMINATION POLICY

NC State provides equal opportunity and affirmative action efforts, and prohibits all forms of unlawful discrimination, harassment, and retaliation ("Prohibited Conduct") that are based upon a person's race, color, religion, sex (including pregnancy), national origin, age (40 or older), disability, gender identity, genetic information, sexual orientation, or veteran status (individually and collectively, "Protected Status"). Additional information as to each Protected Status is included in NCSU REG 04.25.02 (Discrimination, Harassment and Retaliation Complaint Procedure). NC State's policies and regulations covering discrimination, harassment, and retaliation may be accessed at <http://policies.ncsu.edu/policy/pol-04-25-05> or <https://oied.ncsu.edu/divweb/>. Any person who feels that he or she has been the subject of prohibited discrimination, harassment, or retaliation should contact the Office for Equal Opportunity (OEO) at 919-515-3148.