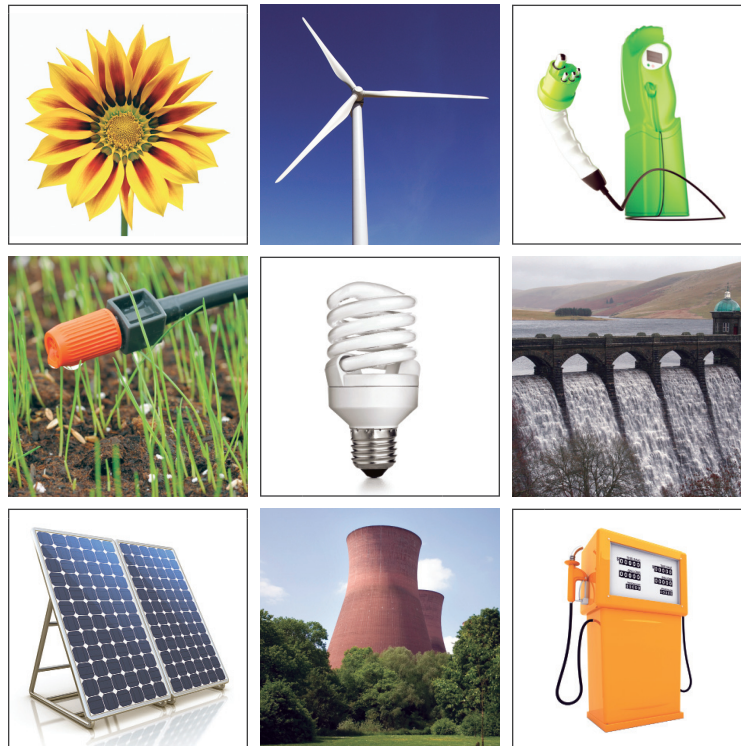


# Clean Energy Technology Curriculum



**College or Career?...Why Not Both?**

# Advanced Career combines college-ready academics with authentic, hands-on projects.

*The New Approach*

## Advanced Career

A rigorous and relevant blend of technical and academic skills in authentic projects

- Advanced Training
- Community/Technical College
- Jobs *(more options)*
- College

*The Old Approach*

**COLLEGE TRACK**

→ College

OR

**CAREER TRACK**

→ Jobs  
→ Training

Schools are challenged to better prepare students for a wide array of postsecondary options. The workforce of today and tomorrow demands a higher level of skill — people who grasp complex problems, understand technology and troubleshoot problems.

Advanced Career (AC) answers both of these needs. By fusing a rigorous academic core with challenging project work and advanced technology in a career pathway program of study, AC courses give students a greater depth of knowledge and skills and prepare them for more options after high school.

## Advanced Career provides:

- ready-to-implement AC course work for students
- comprehensive training for teachers
- access to tools and technology for project-based learning
- end-of-course assessments
- opportunity for industry certification and/or dual credit

## Clean Energy Technology.....

The Clean Energy Technology program enables students to apply fundamental science and operating principles of clean energy systems to authentic problems. Such problems involve motors and generators, photovoltaic systems, water and energy conservation, wind turbines, biofuel generation, bioreactors, water power, energy harvesting, fuel cells and nuclear power. Students use an engineering design process to develop solutions to these authentic problems.

Students master industry-standard simulation and modeling software sourced from the U.S. Department of Energy and related national laboratories as well as National Instruments (NI). Students use Web-based applications, especially those with embedded geographical information systems (GIS) content, to relate geography, climate and terrain with the availability and economics of wind and solar resources.

Students discover how the perceptions of consumers, manufacturers, technologists and regulators shape and affect the rate and scale of clean energy technology adoption. Students analyze prices in energy markets and how prices communicate the opportunity costs of clean energy systems.

Students completing the program may become an NI Certified LabVIEW Associate Developer (CLAD) and may be prepared for earning other relevant industry certifications.



*Clean Energy Technology was developed by SREB and South Carolina as a part of a multi-state consortium to improve career and technical education in this country.*

For more information about other Advanced Career curricula, visit [sreb.org/AC](http://sreb.org/AC).

# Advanced Career

## Clean Energy Technology Curriculum

Clean Energy Technology is for students who want to apply their science and math skills and apply engineering processes as they tackle the world's energy needs within a green point of view.

### Course 1: Clean Energy Systems

This course exposes students to three sources of renewable energy: wind, solar and biofuels. Working with solar, thermal, chemical and mechanical sources of clean energy teaches students how to apply physics, geography, chemistry, biology, geometry, algebra and engineering fundamentals. Students learn the most efficient and appropriate use of energy production as they explore the relevant relationships among work, power and energy. Students will engage in a wide variety of hands-on projects and lab activities that both test their knowledge and illustrate the interrelationships between the various forms of clean energy.

### Course 2: Clean Energy Applications

This course builds on the foundation of Course 1 and introduces nuclear power, steam generation, fuel cells, geothermal power, water power, AC/DC power generation, heat transfer and the laws of thermodynamics. In addition, students now use chemical and thermal energy principles to create, store and use energy efficiently to power a variety of mechanical and electrical devices. Students will engage in a variety of hands-on design projects to demonstrate principles using advanced technology hardware and software.

### Course 3: Clean Energy Strategies

Students in this course utilize applicable skills from the foundational courses to tackle challenges associated with the implementation of clean energy technology. The hands-on projects encountered during this course will require students to address specific issues related to providing portable power in any situation, developing new energy storage systems, increasing the efficiency of the modern home, and designing more energy efficient buildings and homes.

### Course 4: Clean Energy Innovations

The innovations course is the fourth and final course in the Clean Energy Technology Pathway Program. The course will provide students the opportunity to work independently with open-ended, problem-solving scenarios to create an original solution in the area of clean energy entrepreneurship or clean energy research and development. Students will collaborate with a mentor to conduct applied research around a defined research problem, develop solutions, collect and analyze relevant data, evaluate their solutions, and present their findings in public venues and competitions.

# Key Features of Advanced Career

## Fully Developed Pathway Programs

Advanced Career (AC) encompasses a coherent sequence of four ready-to-implement courses; comprehensive training for teachers; access to tools and technology for project-based learning; and end-of-course assessments. To ensure fidelity from site to site, each course has a syllabus that includes instructional philosophy, instructional delivery and support systems, assessment and a recommended grading system.

## Advanced Career Programs of Study

Each AC program of study (POS) is a progression of non-duplicative courses joined with a college-ready academic core and aligned from high school to postsecondary studies. The integration of academic and technical content in each POS prepares students for more options after high school graduation, offers opportunity for dual credit and leads to an industry-recognized credential, advanced training, or an associate's or bachelor's degree. The high-skill, high-wage career fields represented among the AC programs of study are important to the economy.

## Project-Based Learning

Each course is designed around project-based units — featuring essential questions, project descriptions, authentic roles and tasks that require students to utilize an industry-recognized decision-making process. Assignments in AC courses encompass essential elements of good project-based learning to engage students in an extended process of asking questions, using resources and developing answers. Students collaborate and work in teams and develop important 21st-century skills.

## Blended Learning Experiences

AC course work creates rigorous blended learning experiences for all students. Students apply their academic and technical skills to real-world projects in ways that advance their literacy, math, science and technical knowledge and skills, and strengthen their habits of behavior and mind for success.

## Technology and Software

Students employ industry-standard data acquisition hardware and software systems to complete authentic tasks simulating the work of professionals in the field.

## Assessments

Each project unit includes formative and summative assessments. Each course has an end-of-course assessment that measures both academic and technical achievement with the performance level needed for jobs, advanced training and postsecondary credit-bearing courses. In addition, students and teachers complete surveys about what works or does not work in the AC course. This serves to inform continuous improvement of the AC program.

## Counseling for Careers

Student and parent orientation to each AC program of study highlights the career field, including requirements for jobs and postsecondary study in the career field. Each AC course has a career and education exploratory component. Counselors trained to support the AC program will assist students in developing a career and education plan aligned with students' goals and aspirations.

## Teacher Selection, Professional Development and Support

Teachers are selected who have strong math skills and experience in the pathway career field. Staff development is essential and includes an intensive two-week summer institute for teachers to prepare them to teach each course and to use a project-based approach. They will perform students' assignments and use the tools developed by national industry partners. A support team including the principal, counselor and academic teachers in literacy, math and science learn how to support AC teachers and students in course implementation.

## Dual Credit and Industry Certification

Courses three and four in the AC program offer the potential for dual credit when a state or district has an established process for approving such courses. Each AC program of study also offers opportunities for industry certification for students who complete the program.

## Collaboration and Partnerships

Ongoing relationships among education, business and other stakeholders are central to AC pathway programs. Representatives from industry and postsecondary institutions have helped shape the curriculum design and technical content. Serving as an expert panel, they have collaborated with secondary educators and state education agency staff to identify authentic learning experiences for students that can lead to additional opportunities after high school. Organizations represented in the development of the Advanced Career Energy and Power Pathway Program include:

Clemson University	South Carolina Chamber of Commerce	SynTerra
Eaton Energy Marketing Group	South Carolina Department of Commerce	The Citadel
Furman University	South Carolina Department of Education	Tricounty Technical College
Greenville Technical College	South Carolina Energy Office	University of South Carolina
National Instruments	South Carolina State University	USA Today
Midlands Biofuels	Southern Regional Education Board	
Orangeburg-Calhoun Technical College	Southern States Energy	
Santee Cooper		
SolBright Renewable Energy		