

PREPARING LEARNERS FOR RENEWABLE ENERGY CAREERS

Developing Career Pathway Programs for Secondary Students in Energy



RESOURCE OVERVIEW

In May 2019, Governor Polis released the Roadmap to 100% Renewable Energy by 2040 and Bold Climate Action with a goal of establishing Colorado as a leader in the clean energy economy, including high-quality education and training, high-paying jobs, and protecting Colorado's environment.

The <u>U.S. Department of Energy</u> has highlighted creating clean energy union jobs as one of their top priorities and has created a new Office of Energy Jobs to move the initiative forward.

With these state and national goals in mind, it's critical that schools are equipped to raise awareness of these career opportunities and prepared to pursue pathways in renewable energy when interested.

To support these efforts, the <u>Colorado Workforce</u>
<u>Development Council</u> (CWDC) and the <u>Colorado</u>
<u>Office of Career and Technical Education</u> (CTE)

collaborated with other state organizations and industry representatives to develop this resource to support the development of energy career pathway programs in secondary schools.

This resource outlines:

- Energy labor market demands
- Energy pathway development
- · Curriculum development and resources
- · Work-based learning strategies
- · Industry engagement strategies

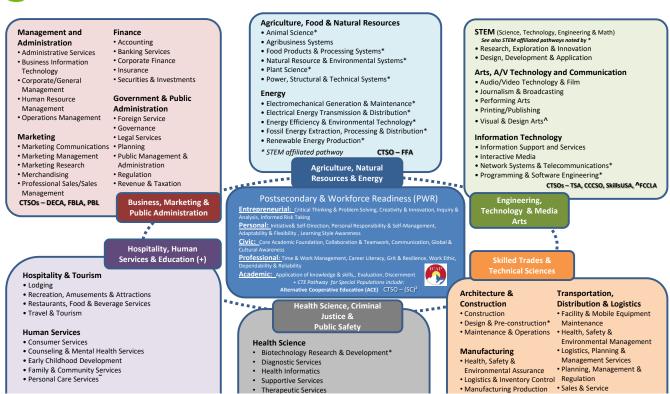
This resource can be utilized to design opportunities for learners to explore occupations and activities in the industry and in the development of career pathway programs leading to careers in energy.

This resource also outlines the tools available in the energy pathway provided on My Colorado Journey, where Solar Photovoltaic Installer/Services, Electrical and Electronics Drafters, Renewable Sales Support, and Renewables Technicians are examples of entry level jobs in renewable energy.



ing that works for Colorado Contractor Cluster Model





As of 2022, Colorado is one of only eight states that highlights Energy as a 17th pathway on the statewide Career Cluster Model.

LABOR MARKET DEMAND & EMPLOYMENT OUTLOOK

In <u>Clean Jobs Colorado 202</u>1, the energy sector is described as one of Colorado's largest employers, with more people who work in clean energy jobs than there are waiters and waitresses, elementary and middle school teachers, and nurses in the state.

Clean energy jobs from 2017-2019 had been growing faster than statewide employment, with the largest increases in clean vehicles (18 percent), energy efficiency (13 percent), and grid and storage, and the clean energy economy has been quickly recovering from job losses during the pandemic. According to the Occupational Outlook Handbook, wind turbine service technicians are the second highest growing occupation in the nation as of June 2022.

The CWDC's 2020-2021 Career Pathways Annual Report also noted that Colorado's energy and natural resources industry is one our fastest-growing industries, employing about 150,000 workers in jobs in nearly every county in the state. Colorado is also home to 30 federally-funded research laboratories as part of the growing renewable energy industry.

Colorado employment projections for installation, maintenance and repair have an average growth rate of 1.63% over ten years (2020-2030). These occupations have 12,094 annual openings amd provide median hourly wages of \$24.12/hour.

According to the 2021 United States Energy & Employments Report, Colorado represents 2.6 percent of all U.S. energy jobs. Of these energy workers, 22,996 are in electric power generation, 30,538 are in fuels, and 28,174 are in transmission, distribution, and storage. The median wage for all energy workers in Colorado is 44 percent above the national median wage.

Additional labor market resources:

- Colorado's Labor Market Information Gateway
- Energy Efficiency Jobs in America 2021
- Clean Jobs, Better Jobs
- Colorado Energy Landscape Analysis

My Colorado Journey

MyColoradoJourney.com is a statewide platform that connects individuals to work, education, support services, and planning resources based on their needs, desires, and stage of life. The free resource provides personalized information to find pathways to good jobs and upgrade skills and credentials, helping users to accomplish their career and education goals.

MY COLORADO JOURNEY ENERGY PATHWAY

In Colorado, industry-driven, competency-based career pathways ensure that education, training, and workforce systems stay attuned and responsive to the needs of the labor market in order to:

- Provide businesses with access to an appropriately skilled talent pipeline
- Prepare learners and workers with the skills and credentials they need for jobs and careers

Each year the CWDC adds career pathways to My Colorado Journey. In 2021 the energy pathway was published in partnership with industry partners. The energy pathway includes opportunities in Utilities, Utility Transmission & Distribution, Renewables (Photovoltaics and Wind Power), Oil & Gas Production & Operation, and Oil & Gas Distribution. The passage of HB21-1149 authorized additional career pathways (such as those for the manufacturing, maintenance, repair, and operation of zero-emission vehicles) to be published on My Colorado Journey in 2022.

Within these pathways users can view entry level, mid level, and professional level positions and the summaries, education and competencies required, credentials, salaries, and job openings in Colorado for each position. They are also able to search for programs that provide additional education and can see how to move into next level positions. Position titles can vary based on partner and setting and may be referred to as many titles. To prepare learners with in-demand skills and knowledge, it is always important to connect with industry partners.

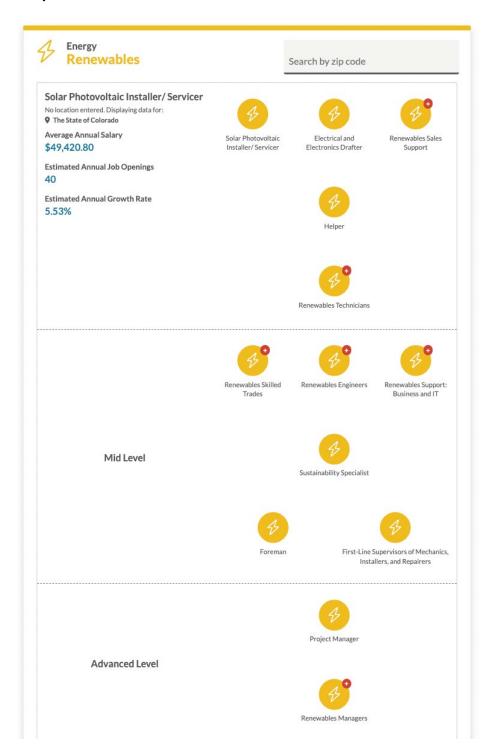
Example Entry Level Occupations:

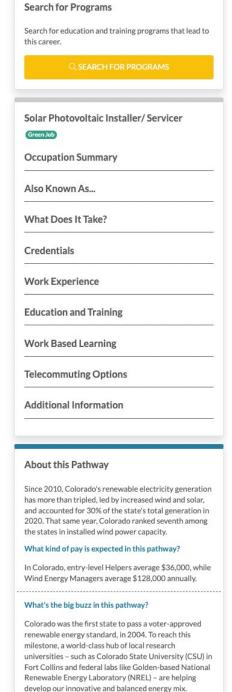
- · Solar Photovoltaic Installer/Servicer
- · Electrical and Electronics Drafter
- Renewables Sales Support
- Renewables Technicians (e.g. for wind turbines)

The image below features a view of the Solar Photovoltaic Installer/Servicer, an entry level position in the renewable energy industry. The position overview outlines what learners may expect once they are in the position and with additional training.

My Colorado Journey Energy Pathway

Snapshot of Solar Photovoltaic Installer/Servicer





COURSEWORK THROUGH CAREER AND TECHNICAL EDUCATION (CTE) AND CONCURRENT ENROLLMENT (CE)

COLORADO CTE COURSE ENERGY PATHWAY SEQUENCE

Agriculture, Natural Resources, & Energy			
Energy Pathway (151701)			
Level 1 Courses	Level 2 Courses	Level 3 Courses	Level 4 Courses
Intro to Energy Technologies (A/B)	Energy Industry Fundamentals (A/B) Power & Energy Tech I	Electricity/ Electronics	AP Environmental Sciences Energy WBL
	(A/B)		Energy Leadership Energy Capstone

Concurrent Enrollment:

CIS 118 Intro to PC Applications

Industry Credentials Available in this Pathway:

CEWD EIF

NABCEP Energy Practitioners

Cluster Cross Over:

Electronic DC/AC - ETMA
Power and Energy Technology I A/B - Skills Trade

SCOPE AND SEQUENCE OF PATHWAY

- Colorado CTE Course Introduction to Energy
- Colorado CTE Course Energy Industry Fundamentals
- Colorado CTE Energy Pathway Resource Page
- U.S. Department of Energy Literacy Standards

Arvada West High School Pilot

Heidi Bankoff, a science teacher at Arvada West High School, developed an Energy Scope and Sequence which she piloted in her classroom in 2021-2022. She's graciously shared her drafts here, knowing that they will get more refined with time

- Energy Scope and Sequence Semester 1
- Energy Scope and Sequence Semester 2

ADDITIONAL PATHWAYS RESOURCES

- Building Industry-Driven Pathways in Colorado
- <u>Guided Career Pathways: A New Postsecondary</u> <u>Framework for Today's Students</u>

WORK-BASED LEARNING COMPETENCIES

In order to best prepare learners to succeed in their careers, it is important to understand the skills and competencies that are needed in the industry. The following resources outline various competencies:

- The CWDC interviewed numerous energy representatives about the competencies needed and reported them on page 7-8 in <u>Appendix C of</u> the 2021 Talent Pipeline Report.
- NABCEP has Job Task Analysis checklists covering competencies in solar and wind in detail at <u>www.</u> <u>nabcep.org/resources</u>.
- The energy pathway in My Colorado Journey outlines job specific competencies that can be

referenced to understand specific positions. These competencies can be found within the "What does it take?" section listed for each occupation (see example below).

Solar Photovoltaic Installer/Servicer: What Does it Take?

Knowledge Required

- Mechanical
- Building and Construction
- Engineering and Technology
- English Language
- Design

Skills Required

- Critical Thinking
- Coordination
- Installation
- Troubleshooting
- Active Listening

Abilities Required

- Problem Sensitivity
- Visualization
- Oral Comprehension
- Information Ordering
- Near Vision

Competencies Required

- Lifelong Learning: Renewables is a growing industry. Careers can go many different directions if employees want to learn more.
- Working with Tools and Technology: The ability to use tools to construct things in a safe manner, mechanical/electrical aptitude, the ability to solve problems, the use of computers, and the ability to read schematics are valuable.
- Communication and Teamwork: You will be working as part of a team, so good communication and teamwork skills and a positive attitude are important.
- Working outdoors: Installation work is generally outdoors and involves physical activity, so an interest in working outside is a plus for many of the jobs.

TEACHING ENERGY

Energy instruction can happen in regular core classes, in exploratory classes, in Career Technical Education (CTE) classes, or through Concurrent Enrollment (CE). The resources and work-based learning strategies shared below can be adapted for all grades, including elementary school, middle and high schools, community colleges, and universities.

INSTRUCTIONAL RESOURCES

CURRICULUM DEVELOPMENT

- <u>Center for Energy Workforce Development</u> <u>Industry Curriculum</u>
- Department of Energy STEM Rising Experiential Education
- Interstate Renewable Energy Council (IREC)
 Interactive Career Maps
- KidWind
- Get into Energy Educator Resources
- Get into Energy, Get into STEM
- National Energy Foundation
- National Energy Education Development (NEED)
 Teacher Resources
- National Renewable Energy Laboratory (NREL)
 Education Resources
- National Renewable Energy Laboratory (NREL)
 Wind Workforce Development
- Office of Energy Efficiency and Renewable Energy (EE/RE) Educator Resources
- Pacific Gas and Electric Energenius Energy Education
- PacNW Center of Excellence for Clean Energy
- REpowering Schools
- · Solar Energy International (SEI) Free Learning
- TryEngineering
- University of Wisconsin K-12 Energy Education Program (KEEP) Resources
- U.S. Environmental Protection Agency (EPA)
 Lesson Plans

PROFESSIONAL DEVELOPMENT FOR EDUCATORS

- National Energy Education Development
- National Renewable Energy Laboratory (NREL)
 Programs for Teachers
- We Share Solar

LEARNER OPPORTUNITIES

- Colorado Community College System Energy Training and Careers Student Resources
- Colorado Rural Electric Association Youth Programs
- Energy Day
- Get into Energy Student Pathways
- National Renewable Energy Laboratory (NREL) Student Programs
- Renew Our Schools Competition
- Solar Car Challenge
- · Solar Energy International (SEI) training

RESOURCES FOR PURCHASE

- Solar Energy International (SEI) Curriculum
- Whitebox Learning

OTHER RESOURCES

- American Clean Power Renewable Energy Resources
- Colorado Department of Labor and Employment Energy Careers site
- National Renewable Energy Laboratory (NREL)
 Solar Resource Data, Tools, and Maps
- National Renewable Energy Laboratory (NREL)
 Wind Resource Data, Tools, and Maps
- TalentFOUND glossary

Energy Day Colorado

Energy Day is a free family festival consisting of nearly 70 interactive demonstrations and exhibits that teach students and their families about the various forms of energy and science, technology, engineering, and mathematics that go into energy and STEM careers. The festival also focuses on efficiency and conservation while providing opportunities for students to interact with energy and STEM experts to help spark an interest in these careers.

CONCURRENT ENROLLMENT INSTRUCTOR INFORMATION AND QUALIFICATIONS

The Concurrent Enrollment (CE) program provides high school students with the opportunity to enroll in postsecondary courses and earn college credit at no tuition cost to them or their families. Institutions of higher education determine the qualifications required to be an instructor for their college-level courses. Sometimes a master's degree in the content area is required. Other times at least 18 graduate credits in the content area plus a master's degree in another area are the minimum.

If the CE course is part of an approved postsecondary CTE program, then the instructor qualifications are generally more focused on hours in the field/industry and less on graduate credit hours. It depends on the institution and each academic department. Contact the concurrent enrollment office at the institution your school partners with to learn more.

Some concurrent enrollment instructors may or may not require a Colorado Department of Education (CDE) license/credential. For example:

- High school teacher employed by a district may be required to have a CDE license/credential to teach another subject but not the CE course.
- Concurrent enrollment instructor contracted by a district - not required to have a CDE license/ credential but needs to be approved by the college.
- Concurrent enrollment instructor employed by a college - not required to have a CDE license/ credential and already approved by the college.

CONCURRENT ENROLLMENT RESOURCES

- At the time of publication, CIS 118 Intro to PC Applications available at multiple <u>Colorado</u> <u>Community Colleges</u>
- CDE Concurrent Enrollment
- CDE Concurrent Enrollment Guidelines and FAQs and Resources
- <u>CCCS Concurrent Enrollment Resources</u> for high school students

CTE ENERGY PATHWAY EDUCATOR CREDENTIALING

- Secondary CTE Energy Certification Requirements
- CTE Teacher Endorsement with Colorado Department of Education
- CEWD Instructor Certifications

INDUSTRY PARTNERSHIPS

Ensuring that programs are industry driven and in-demand is essential to learner success. Any career pathway program should be developed in partnership with and informed by industry in order to ensure alignment to industry needs and opportunities.

Below are recommendations to connect with the energy industry and develop strong industry partnerships:

- Review the <u>Work-based Learning Incubator Engaging with Business materials</u> to learn more about making a business case. Business cases are utilized to show industry partners the benefits of working with schools.
- Colorado Energy Office
- Colorado Energy Office Utilities Contacts

INDUSTRY ENGAGEMENT STRATEGIES

- JFF Employer Engagement Toolkit: From Placement to Partners
- Colorado Succeeds "Building Business Partnership"
- Mission Minded "Making the Case for Work-Based Learning: How to Convince Business Leaders to Join In"
- Advance CTE Employer Engagement Resources

INDIVIDUALIZED CAREER AND ACADEMIC PLANNING (ICAP)

ICAP is a multi-year process that intentionally guides students and families in the exploration of career, academic, and postsecondary opportunities. With the support of adults, students develop the awareness, knowledge, attitudes, and skills to create their own meaningful pathways to postsecondary and workforce readiness. ICAP is a strategy to be used with all students, and can start at younger grades.

- Find resources on the Colorado Department of Education <u>ICAP website</u>
- Have <u>Meaningful Career Conversations</u> with these prompts and conversation starters from American School Counselor Association
- Learn the <u>Seven Steps for Career Conversations</u> from the Colorado Education Initiative

WORK-BASED LEARNING

Work-based learning is a continuum of activities that occur, in part or in whole, in the workplace, providing the learner with hands-on, real world experience. It combines skill development with training opportunities and is a key strategy in Colorado for developing talent and preparing Coloradans for the workforce and evolving labor market.

Work-based learning (WBL) programs are instrumental in quality career pathways that enable learners and job seekers to secure industry-relevant skills, certifications, and credentials and advance to higher levels of education and employment.

The Office of the Future of Work (OFOW) in the Colorado Department of Labor and Employment (CDLE) developed Work-based Learning Quality **Expectations** in alignment with Colorado's existing Work-based Learning Continuum in 2022.

The Colorado WBL Continuum illustrates the variety of work-based learning activities that can be pursued by Coloradans, divided into three categories focusing on career exploration through Learning About Work, career testing through Learning Through Work, and career development through Learning At Work.

The WBL Quality Expectations offers definitions of the WBL activities in each category along with a description of high quality and information on how to demonstrate the expectation. This tool can be used to determine how to continuously improve your WBL programming.

The work-based learning examples outlined in the following sections can help to develop experiences for learners to explore the industry and decide what path they would like to take into the energy sector.

COLORADO'S WORK-BASED LEARNING CONTINUUM

Work-based learning is a continuum of activities that occur, in part or in whole, in the workplace, providing the learner with hands-on, real world experience.

LEARNING ABOUT WORK **LEARNING THROUGH WORK LEARNING AT WORK** Career awareness and exploration Career preparation supports career Career training occurs at a work site and readiness and includes extended direct prepares individuals for employment. helps individuals build awareness of the variety of careers available interaction with professionals from industry and provides experiences that help and the community. inform career decisions. Career Counseling • Clinical Experiences Apprenticeship • On-the-job Training Career Planning Credit-for-work Experiences Career Fairs Internships • Employee Development • Career Presentations • Pre-apprenticeship • Industry-sponsored Project • Industry Speakers Informational Interviews • Supervised Entrepreneurship Mentoring Experience • Worksite Tours • Project-based Learning **Education Coordinated Business Led OUTCOMES:** Skilled Talent for Business + Meaningful Careers for Students & Job Seekers

LEARNING ABOUT WORK

Learners should be able to participate in any of the activities in the "Learning About Work" section with an energy focus. Varied activities through different focus areas will provide a well-rounded experience enabling learners to further narrow down what area of the energy profession they may be interested in.

- Individualized Career and Academic Plan (ICAP) resources can guide career and interest exploration for youth and young adults
- CDE's <u>PWR Playbook</u> has numerous examples of career exploration strategies
- Virtual Job Shadow is free for Colorado residents when accessed through <u>Connecting Colorado</u> and features videos and other resources around the energy industry
- Project-based learning creates hands-on learning experiences
- Learners can interview professionals and beginning developing their own network through informational interviews

Paonia and Delta High Schools Partner with Solar Energy International

Nine Paonia High School students worked for a week alongside Empowered Energy Systems LLC, who donated their time to the project, to install a 10kW ground mount solar system. The students learned about every step of the installation process from excavation and pouring concrete to wiring the solar panels. They can leverage the skills they gained from this experience to pursue a career or continuing education in the solar industry or other technical trades. The system will output around 16,000 kWh/year of solar electricity and save the school about \$1,500/year.

Fourteen Delta High School students worked with their science teacher to design and install a 5kW pole mount solar system as the first phase of construction in the DHS Solar Lab. This project was both designed and installed by students in Mr. Graves' Solar Energy Training program, a class designed through a partnership with Solar Energy International. Learn more.

LEARNING THROUGH WORK

INTERNSHIPS

- Colorado Springs Utilities STEP
- Department of Energy High School Internships

Denver Public Schools Internship

In spring 2022, the City of Denver Climate
Action and Sustainability (CASR) Department
awarded Denver Public Schools' Career and
College Success Department a three year grant
supporting the expansion of work-based learning
opportunities in the sustainability field. As a result,
students have multiple opportunities to learn
about and experience renewable energy careers,
including career exploration events, mentoring,
internships, and a summer career academy.

Career exploration events highlight businesses and organizations that focus on sustainability, such as Jack's Solar Garden and the National Renewable Energy Lab (NREL). The mentoring program is focused on renewable energy career exploration and personalized education planning.

The Renewable Energy Academy offers up to 20 students the opportunity to:

- Learn about careers in green construction
- Complete Solar Installer Basic Training through GRID Alternatives
- · Participate in project-based learning
- Receive mentoring from industry professionals

Denver Public Schools also partnered with the African American Trade Association to develop 10 internships in the green construction industry, including those focused on community outreach, water conservation, and solar design and installation. Students will complete 120 hours over six weeks, working toward specific learning objectives and assigned projects.

For more information, contact Monica Schultz at monica_schultz@dpsk12.net or 720-423-1267.

INDUSTRY-SPONSORED PROJECTS

Industry-sponsored projects must be overseen by industry partners, as these are different from the project-based learning examples in the "Learning About Work" section. Examples include:

- Completing small research projects connected to a real need at a partner business
- Designing replacements for equipment of components that are no longer available
- Creating a prototype to solve an industry challenge

LEARNING AT WORK

APPRENTICESHIPS

- OFOW Apprenticeship Colorado website
- Colorado Apprenticeship Directory
- Apprenticeship Training Resources

LIABILITY, AGE RESTRICTIONS, AND REGULATIONS FOR HIGH SCHOOL STUDENTS

There are a number of authorities who determine what is allowable and what is not allowable for minors. Be sure to clarify what decisions are being made as a matter of company policy or insurance requirements versus what is required under the law. In some cases, once companies recognize their company policy is the barrier to increasing their talent pool, they may want to address their policies.

District legal teams and industry partners can be helpful contacts in understanding age requirements

and permissible activities for young adults. Below are some example questions to ask when learning more about allowances and limitations while working in the field with providers in work-based learning experiences. Additionally, review the WBL Myth Busting document and youth labor laws for more information.

- What safety training will be provided to the learner?
- What is a learner allowed to do in the field?
- What is a learner allowed to observe in the field?
- Can a learner work 1:1 with peers?

CREDENTIAL ATTAINMENT

These credentials have been named by industry as valuable to the Energy Industry

- Energy Industry Fundamentals (CEWD EIF)
 - ♦ Energy Industry Fundamentals provides a broad understanding of the electric and natural gas utility industry and the energy generation, transmission, and distribution infrastructure, commonly called the "largest machine in the world," which forms the backbone for the industry. The course includes business models, regulations, types of energy and their conversion to usable energy such as electric power, how generated power is transmitted and distributed to the point of use, emerging technologies, and the connection to careers in the energy industry.
- NABCEP Associate
 - The NABCEP Associate Program recognizes individuals who have demonstrated knowledge of the fundamental principles of the application, design, installation, and operation of Photovoltaic, Solar Heating or Small Wind energy systems.

FUNDING STREAM CONSIDERATIONS

- The <u>Concurrent Enrollment Expansion Grant</u> can be utilized to help pay for teachers to be credentialed to teach concurrent enrollment.
- The <u>School Counselor Corps Grant</u> can support funding for a school counselor to lead this work part-time as long as this program supports goals of the individual school.
- The <u>Work-based Learning Funding Matrix</u> assembled by the CWDC describes potential
- sources of funding that can be used for program development.
- The <u>Career Development Incentive Program</u>
 (<u>CDIP</u>) offers financial incentives for school
 districts who have learners complete approved
 programs.
- The <u>Innovative Learning Opportunities Program</u> (<u>ILOP</u>) allows schools to count part-time students as full-time if they are engaging in certain careerconnected activities.
- Investing in Quality: Funding the Perkins V Comprehensive Local Needs Assessment

EQUITY IN ENERGY PATHWAY PROGRAMS

According to the <u>United States Energy and</u>
<u>Employment 2021 Report</u>, the diversity of the energy workforce does not represent the country as a whole.

When developing energy pathways, it is critical to offer equitable access and create pathways for greater inclusion.

EQUITY RESOURCES

- Advance CTE's Access and Equity Resource Center
- CWDC Talent Equity Agenda
- Help Wanted: Diversity in Clean Energy
- Inclusive Internship Programs: A How-to Guide for Employers
- JFF's 10 Equity Questions to Ask about Career and Technical Education
- Racial Equity Impact Assessment Toolkit
- She Built This City
- Solar for Women

NEXT STEPS

Reach out to the Agriculture, Natural Resources, and Energy Program Director at the <u>Colorado Office of Career and Technical Education</u> (<u>cte@cccs.edu</u>) for more information about CTE programming and coursework.

Reach out to the Education Consultant with the Colorado Department of Education and the Colorado Workforce Development Council (cwdc@state.co.us) for information about work-based learning and industry partnership.

THIS RESOURCE WAS DEVELOPED IN PARTNERSHIP WITH

Colorado Workforce Development Council (CWDC)

Colorado Department of Education Office of Postsecondary Workforce Readiness (CDE)

Colorado Community College System (CCCS)

Colorado Office of Career and Technical Education (CTE)

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CalCom Energy

Center for Energy Workforce Development

E2

Grid Alternatives Colorado

Lyra Colorado

Solar Energy International

Xcel Energy

Questions or Comments? Contact the Colorado Workforce Development Council <u>coworkforcecouncil.com</u> | <u>cwdc@state.co.us</u> | @the_cwdc