

# Career Pathways Annual Report – HB15-1274

Energy Career Pathways 2020 - 2021

## Themes and Opportunities

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:

- Ensure businesses have access to an appropriately skilled talent pipeline.
- Prepare students and workers with the skills and credentials they need for jobs and careers.

For additional information on career pathways as a strategy please refer to this webpage: <https://cwdc.colorado.gov/strategies/career-pathways>.

An overview of the key themes that emerged from career pathways discussions with energy industry employers from July 2020 to June 2021 are below.

## Energy Industry-wide Themes

The following overview information was identified by employers about the energy industry (and included in the energy industry pathways in [My Colorado Journey](#)):

- Bountiful Colorado: Colorado has some of the most bountiful oil and gas reserves in the country. We've got lots of sun (more than 300 days, to be exact) and wind and we have numerous solar power and wind resources sprinkled throughout the state.
- A National Leader in Energy: Colorado is an energy production leader. We rank in the top 10 states for oil and natural gas production. Our solar and wind net generation has tripled since 2010, with renewables accounting for 30% of our state's total generation by 2020, according to this report from the U.S. Energy Information Administration (<https://www.eia.gov/state/?sid=CO>). Every aspect of Colorado's energy sector is embracing environmental protections.
- A Thriving Industry: Colorado's energy and natural resources industry supports about 150,000 workers and accounts for nearly \$11.4 billion in revenue annually, most of that in wages. It's also one of our fastest-growing industries. Energy jobs can be found in skyscrapers, laboratories, and the field, and in nearly every county in the state.
- A Knowledge-based Economy: Strong collaboration among Colorado's universities, educational institutions, and public agencies provide the foundational research and education for new cleantech innovations. In addition, the state's 30 federally funded research laboratories are vital assets for the growth of the energy industry.

## Energy Pathway-specific Themes

The following items were identified about specific pathways from the same discussions with energy industry employers from July 2020 to June 2021. This information was also included in My Colorado Journey for those pathways.

### Utilities Generation

- Energy Generation is using natural resources like the sun, wind, water, coal or natural gas to create energy, which is then transformed for delivery to a “grid” for transmission and load management. Grid security unites cybersecurity with physical facilities stability.
- An overview of how Utilities deliver electricity to your home/work is at <https://www.csu.org/Pages/ElectricDistribution.aspx>.
- Utilities jobs require talent in many disciplines, from business operations (e.g. safety, legal and managerial), to engineering, to crews constructing and maintaining transmission towers, distribution lines, transformers, rights-of-way and even vehicle fleets.
- Electricity: Colorado has two Investor-owned Utilities, 23 Cooperative (member-owned) Utilities, and several Public Power & Municipal Utilities, selling either wholesale or retail power, with more detail at <https://energyoffice.colorado.gov/electric-utilities>. This was also included in the “Utilities Transmission & Distribution” pathway.
- Information about the 15 Natural Gas Utilities is at <https://energyoffice.colorado.gov/natural-gas>. This was also included in the “Utilities Transmission & Distribution” pathway.
- Apprenticeships are a key part of career advancement in Utilities, providing the opportunity to earn while you learn. Examples of existing apprenticeships are at <https://coloradospringsutilities.jobs/students-apprenticeships/>. This was also included in the “Utilities Transmission & Distribution” pathway.
- Camaraderie among crew workers is strong, based on safety and teamwork. Women are increasingly drawn to these trades (more information is available at <https://www.publicpower.org/periodical/article/women-public-power-blaze-path-others-join-high-voltage-trades-line-work>). This was also included in the “Utilities Transmission & Distribution” pathway.

### Utilities Transmission & Distribution

- Energy Transmission brings the energy from the generation plant to a grid of networked facilities, then to your town where it is distributed to your home/business. Today, “smart” homes contribute to a feedback loop that aids in energy load management and efficiency.

- Drones are a growing trend for patrolling and fixing electrical lines. “Smart” devices (like thermostats) in homes and commercial buildings contribute to a feedback loop that aids in energy load management and efficiency.

## **Renewables**

- Since 2010, Colorado's renewable electricity generation has more than tripled, led by increased wind and solar, and accounted for 30% of the state's total generation in 2020. That same year, Colorado ranked seventh among the states in installed wind power capacity.
- Colorado was the first state to pass a voter-approved renewable energy standard, in 2004. To reach this milestone, a world-class hub of local research universities – such as Colorado State University (CSU) in Fort Collins and federal labs like Golden-based National Renewable Energy Laboratory (NREL) – are helping develop our innovative and balanced energy mix.
- Companies can focus on creating renewable solutions in residential or commercial (often creating large energy “farms”) settings. They also usually focus on one of the following: solar, wind, hydroelectric, geothermal, etc.
- Many jobs focus on initial renewable energy installations, but a large part of the industry also focused on operating and maintaining installations, including managing existing assets.

## **Oil & Gas Production & Operation**

- Most Colorado homes are heated with natural gas, and much of Colorado's oil is refined into vehicle/jet fuel or used in asphalt. Extraction involves large, complex machinery and is concentrated in Weld, Mesa, and La Plata counties, though production exists across the state. Be part of a field that powers ingenuity and is embracing environmental safety.
- Oil and gas has a long history of entrepreneurs taking risks, with some striking it big! Those entrepreneurial opportunities still exist today.
- Most of Colorado's companies focus on upstream (oil/gas production) and midstream (creating facilities, pipelines, etc. that deliver the oil/gas to the market). Colorado doesn't refine much oil, but we do have downstream companies to deliver natural gas to homes and businesses.
- The differences between working for large and small operators in oil and gas can be significant. Small operator employees often handle communications, strategy, sales, HR, and business functions that in a large operating company could be separate departments. There may also be a trade-off between opportunities to learn multiple facets of the business versus the opportunity to dive more deeply in one area while still having advancement opportunities.

## Oil & Gas Distribution

- Once extracted from the earth, virtually all oil and gas is piped or shipped by truck/rail to storage facilities or refineries to make it useful for manufacturers or consumers. Nearly three quarters of Colorado homes use natural gas for heat so pipelines need to be constructed, maintained and inspected by trained technicians.
- The business side of the industry offers a wide variety of opportunities, including in data/cost analysis, supply chain and logistics, asset management, complicated revenue and billing, specialized accounting, layering technology into engineering, and a variety of land-related environmental, leasing, and regulatory roles.
- Most people think of the production and operation companies that drill wells. They are a critical part of the industry, but a wide variety of companies support them, such as those focusing on construction, transportation, logistics, investment, and business operations.

## Energy Occupation-specific Themes

The following items were identified about specific occupations from the same discussions with energy industry employers from July 2020 to June 2021. This information was also included in My Colorado Journey for those occupations. Please note that the list is ordered by the first of the pathways the occupation appears in and from entry-level to advanced-level within the pathway.

### Utilities Generation

- Helpers are important entry-level roles with the possibility of moving into a skilled trades position through an apprenticeship. “Storekeeper” or “Warehouse” roles focus on getting materials to the crews. These can be career paths on their own or can feed into more technical roles.
- Two non-traditional pathways to jobs in the Utilities sector were mentioned:
  - Navy Nuclear Operations and Machinist’s Mate are considered a good preparatory job for a move into the Utilities sector.
  - One employer hired operators from a brewery to fill their Plant Operator roles.
- Environmental Engineers and Technicians play a key role in the production of energy with the enhancement and use of technology to monitor and reduce greenhouse gas emissions, an example of a growing area of expertise employers often struggle to find in Colorado.
- A Professional Engineer license is highly valued in the Energy industry. This applies to many different engineering roles such as Environmental, Chemical, Mechanical, etc.

## Utilities Transmission & Distribution

- Meter Reader: Some utilities (often in urban settings) have automated this role and no longer have Meter Readers. However, they do have a Meter Technician that diagnoses and fixes issues with meters, with the skills often obtained through an apprenticeship. In rural areas, this role often still exists.
- Electrical Power-Line Installers and Repairers represent a significant need for Electric Utilities and an important entry-level opportunity. Advancement to a qualified Journeyman Line Worker is highly valued in the industry. Power-line Repairers take care of their community by going out when the storm rolls in. You can start as an apprentice, move to Power-Line Installer and Repairer and move up to Foreman.
- Security and emergency preparedness roles have a lot of focus within the Utilities sector.

## Renewables

- Installers/Serviceers provide a good entry point into a Renewables career, with opportunities to advance to Sales, Electrician, Project Supervisor and Engineer, since they have experience with what can and can't be built. Improvements in software have also allowed Installers/Serviceers to complete more of the design work, allowing Engineers to be brought into the process later than before.
- Drafter provides a good entry point into a Renewables career, with opportunities to advance to Photovoltaic Designer, Supervisor, and beyond.
- Wind Turbine Technicians have been identified as one of the fastest growing jobs in the U.S. (<https://www.bls.gov/ooh/fastest-growing.htm>). They are in high demand in Colorado and across the country. Some companies support travel to jobs in different locations.
- Companies also have a lot of electrical contractors on other construction sites (not in-house electricians) that require familiarity with the parts of the National Electrical Code (NEC) that pertain to Photovoltaics and Photovoltaic interconnections.
- In Colorado, if you are an Electrician working in the solar industry, you need to go through an apprenticeship registered with the Department of Regulatory Agencies (DORA) registered within 30 days of starting on the job. Previously, work could be completed by someone with a NABCEP certification, but now a Licensed Electrician is required.
- Grid Engineers are becoming a more critical role as the grids add more "smart" equipment.
- A NABCEP certification is valued for Photovoltaic Designers. Photovoltaic Designer is a good role to fill for someone with an Engineering degree, or while someone is studying to become an Engineer.
- Environmental Compliance Inspectors play a key role in energy production in a way that protects our environment and other natural resources.

- There is a shortage of environmental workers that keep up with regulatory changes in Colorado.

## **Oil & Gas Production & Operation**

- Derrick Operator: Many people break into the industry doing construction or working on a drilling rig before moving into a more advanced job.
- Roustabout: Many people break into the industry doing construction or working on a drilling rig before moving into a more advanced job.
- Service Unit Operator: Once a well is producing, efforts focus on increasing or maximizing how much it is producing by refining/improving operational efficiency.
- Wellhead Pumper: Once a well is producing, efforts focus on increasing or maximizing how much it is producing by refining/improving operational efficiency. Wellhead Pumpers complete repairs and maintain wellhead equipment.
- Petroleum Techs (or Production Techs) can analyze production numbers collected from the field to help increase oil/gas production.
- Petroleum Engineers can focus on improving the flow of one well or maximizing production on an entire reservoir of oil/gas that consists of many different wells. Working as an Engineer is a good preparatory role for becoming a Project Manager, after adding skills to be responsible for the full life-cycle of a project that involves many different teams.

## **Several Construction Jobs are in High Demand in the Energy Industry**

- Foremen
- Electricians: Getting an Electrician license is important to work in the Energy industry, with a Journeyman license being highly valued. Electricians were also identified as a Critical Occupation in Renewables.
- Plumbers and Pipefitters
- Welders
- Heavy Tractor Trailer and Commercial Drivers

## **Some Business Operation Jobs are in High Demand in the Energy Industry**

- Accountants in the industry benefit from expertise in revenue sharing and joint interests.
- Data analytics is a critical skill set across many occupations.
- There is a shortage of qualified Project Managers or Project Coordinators in multiple parts of the industry.
- Sales Representative and PV Installer both provide a good entry point into a Renewables career, with opportunities to advance within Business Operations, to Supervisor and beyond. You could start in Renewable Energy sales by working to generate leads for new installations. In smaller companies you could also be

working with Installers on a regular basis. Some choose to work as Installers first to better understand how solar works.

## Competencies

The following items were identified as being valued by employers. A competency is the capability to apply a set of related knowledge, skills, and abilities to successfully perform functions or tasks in a defined work setting. Competencies often serve as the basis for skill standards that specify the level of knowledge, skills, and abilities needed for success, as well as potential measurement criteria for assessing competency attainment. My Colorado Journey presents competency information to students and jobseekers to help them prepare for success in a job and career.

### Utilities

Employers identified the following competencies as being most important for success in an entry-level utilities role:

- Safety: Safety knowledge is critical from entry-level to top management.
- Working with Tools and Technology: Many of the technical roles use tools as an important part of their day-to-day job.
- Communication and Teamwork: Good communication skills (verbal and written) are important both with team members and customers.
- Problem Solving, Decision Making, and Analytical Thinking: Many of the day-to-day activities of technical and customer service roles are related to solving problems.

Employers identified the following competencies as being most important for success in utilities mid/advanced-level roles:

- Critical and analytical thinking, problem solving and decision-making
- Written and verbal communication
- Computer and technology skills
- Business fundamentals
- Initiative

### Renewables

Employers identified the following competencies as being most important for success in entry-level renewables roles:

- Lifelong Learning: Renewables is a growing industry. Careers can lead you in many different directions for employees who show the initiative 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 of value for many of the jobs.

Employers identified the following competencies as being most important for success for mid/advanced-level Renewables roles:

- Problem Solving/Critical Thinking: Independently solving more and more complex problems enables you to work on more complex installations.
- Business Fundamentals: Understanding the basics of what makes a business successful will help you deliver more value to your employer.
- Customer Service: For the jobs dealing directly with a customer, developing good customer service skills (such as a helpful attitude/empathy, problem-solving and communications) is important for career advancement.

## Certifications Valued

The following certifications were identified as valued by employers.

### Utilities

- The following certifications were mentioned by two employers: Journeyman Lineman (having completed a registered apprenticeship), Engineer (Professional Engineer), Commercial Drivers License, and Certified Public Accountant
- The following certifications were mentioned by one employer: OSHA certifications, Human Resources (Society for Human Resource Management and Professional in Human Resources), North American Electric Reliability Corporation (NERC) certifications, line school certification for apprentice lineman, Certified Safety Professional, Project Management Professional, Niche Certifications in Information Services and Legal, Staking Engineering - Dept of Labor Certificate, Meter Technician - Dept of Labor Certificate

### Renewables

- The only certifications mentioned by multiple employers were OSHA 10 and Global Wind Organisation ([GWO](#)). North American Board of Certified Energy Practitioners ([NABCEP](#)) certifications were mentioned in the discussion several times – it is preferred, but not required for most entry-level jobs (employers usually sponsor the certification after you start). Because of regulations in Colorado, having an electrical license is more important than the NABCEP certification.
- The following certifications were mentioned by one employer: Project Management Professional, AUTOCAD, heavy equipment operation certifications and CPR/First Aid (for construction), and Forklift and Aerial Lift certifications (for Photovoltaic Installers, warehouse workers, and project managers).



## Critical Occupations

The following jobs received votes for Critical Occupations within the energy industry. Critical Occupations are identified by the industry as the occupations for which the industry may be facing shortages, difficulties in hiring or retention, or are occupations needed for a comprehensive career pathway. While no jobs received enough votes to identify them as Critical Occupations, we wanted to provide the information that was obtained in these meetings.

### Renewables

- Solar Installer - There was strong feedback that Solar Installer and Wind Turbine Tech could be identified as Critical Occupations, but there were not enough votes received to identify them officially.
- Electrician, Licensed
- Solar Project Developer/Designer
- Commercial Project Manager
- Traveling Wind Turbine Technicians
- Mid- to senior-level electrical design engineers with solar experience - The industry representative that identified this as a Critical Occupation added, "In my experience utility scale electrical solar design engineers are the most in-demand, high-level jobs in Colorado."

### Utilities

- Journeyman Line Workers with experience
- Instrumentation Electronics and Control Technicians
- Electrician
- In general Skilled Trades and Engineering roles are critical (one person specifically mentioned Pipefitters)
- Safety Relay Technician
- Executive level positions

### Oil and Gas

- Field Manager/Operations Manager
- Pumpers
- Revenue Accountant
- Engineer (engineering is a key asset for multiple positions)
- Environmental Engineer (This job can occur in-house in larger companies, while smaller companies will often turn to consultants to fill this need)
- Geologist
- Operations Manager (Oversees all of the activities on engineering, land, or field sides)

- Construction trades

## **Additional Feedback**

The following additional information was offered by industry leaders for potential follow-up, in response to two specific questions:

1. What are industry needs or challenges for education and training providers?
2. What opportunities exist to better train, attract and retain talent in energy professions?

## **Education and Training Needs/Challenges**

### **Renewables**

- Cost of training and certifications for external GWO training is fairly expensive at \$1500-\$2500 (referring to a set of Global Wind Organisation training standards). Applicants with this credential are valued and seen as candidates for career advancement. The cost for renewal of certifications and continuing education credits can also be problematic, especially for those that are now less valued in Colorado (e.g. NABCEP).
- Support for providing entry-level workers with tools, boots, and safety apparel is a need expressed by employers.

### **Utilities**

- There are many challenges tied to the lack of appropriate funding at the K-12 level for trades-related careers. In addition, honoring and valuing the role of the trades and the career opportunities they offer is an issue in the education system and among parents and society in general. College is not required for many of these careers and advanced training is accessible through apprenticeships (work-based learning). Some employers in the trades provide tuition assistance for their employees.
- Training to create basic professional skills, computer training, and trade school initiatives are issues to be addressed.

## **Talent Attraction/Retention Opportunities**

### **Renewables**

- Multiple employers mentioned believing the industry could do a better job recruiting diverse talent, particularly women.

- Skilled trades are a great alternative to college. With an electrical license you have a career (not just a job), start making money as you learn the trade, and graduate with no debt. For instance, Independent Electrical Contractors "IEC" provides electrical apprentice training.
- Employers who work to build an inclusive work culture may attract more job applicants and benefit from employee retention.
- A need was expressed to get the word out that Wind Turbine Technician is the fastest growing job in the U.S. (<https://www.bls.gov/ooh/fastest-growing.htm>).
- Questions such as working at heights and outside in the cold should be addressed during training. Training partners in the military ask this upfront to all students and report that it helps.
- KidWind is a nonprofit that teaches young people about Renewables through their KidWind Challenge, which offers teacher training and classroom activities (<https://www.kidwind.org>).

## Utilities

- We need to engage with youth about energy jobs sooner, even as early as K-8.
- Offer and promote internship programs with high school and college students.
- Connect the mission to serve to the career, for example: Journeyman Line Workers take care of their communities by going out when the storms roll in and restoring power to those who need it.
- Attract and retain employees through enhanced job security and sustainable wages.
- Increase access to training through apprenticeships.
- Communicate the high-tech tools that make the jobs safer and/or more exciting, e.g. the growing use of drones for patrolling electrical lines.
- More advertising on what the careers are, what the work involves, what the income opportunities are, etc. Mike Rowe (the Dirty Jobs guy) talks about this frequently and would be a great spokesperson for an ad campaign. There is a program in North Carolina called "She Built this City" which is bringing the trades into the K-12 system and doing it well (<https://shebuiltthiscity.org/>).
- Engage with high school programs that have applicability across the energy sector, like the robotics competition and other programs offered by FIRST (<https://www.firstinspires.org>) and similar organizations..
- Reach out to school athletics programs. The skills they teach (teamwork, physical fitness, strategy) are transferable to utilities as well.