

CAREERS FOR COLORADO'S NEW ENERGY ECONOMY

Energy Efficiency • Wind • Solar • And More



Governor's
Energy Office

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ENVIRONMENTAL DEFENSE FUND

finding the ways that work

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The Governor's Energy Office's (GEO) mission is to lead Colorado to a New Energy Economy by advancing energy efficiency and renewable, clean energy resources. For more information, please visit <http://www.colorado.gov/energy>.

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Introduction

In this difficult economy, Coloradans are looking for high quality, rewarding careers that provide financial stability. This guidebook focuses on one area of opportunity: careers in Colorado's New Energy Economy.

"We in Colorado have made developing a New Energy Economy a top priority these past few years. We're creating thousands of new jobs, attracting countless new companies, and leading America toward a new, more diverse and more secure energy future."

- Colorado Governor Bill Ritter¹

Our state is a nationwide leader in renewable energy research and deployment, and a broad array of dynamic clean energy and green technology companies call Colorado home. Many Coloradans are already hard at work performing energy audits that help homeowners save money; designing and manufacturing high-performance, energy efficient windows; or building wind farms that can power thousands of homes. And despite the economic downturn, many of our New Energy Economy companies are continuing to grow and hire new employees.

These jobs are an opportunity for workers, urban or rural, highly skilled or entering the job market for the first time, to build a high quality, full time career. 400 foot wind turbines must be manufactured close to their future homes. Careers improving the energy efficiency of Colorado homes and businesses cannot be outsourced overseas. These careers are a new opportunity to build a strong, long lasting foundation for Colorado's middle class, both now and into the future.

What careers are available in Colorado's New Energy Economy?

In many cases, a clean energy or green technology job requires the same skills and training as a job in manufacturing, installation, fabrication or operations; it just applies those skills to the growing field of clean energy and green technology. Electricians can use their knowledge to install solar photovoltaic panels, while machinists can use their skills to manufacture wind turbine components.

Equally important, these opportunities are available throughout Colorado. Companies may hire workers to manufacture wind turbines on the Front Range at the same time that construction and maintenance employees are needed to build and staff turbines operating on the wind-swept Eastern Plains.

What information can I find in this guidebook?

This guidebook is a tool for anyone interested in learning more about careers in Colorado's New Energy Economy. In this book, you can find descriptions of dozens of different jobs in clean energy, energy efficiency and climate solution sectors. These job profiles provide an initial sampling of the kinds of careers available in Colorado's New Energy Economy. However, this list is by no means comprehensive: there are numerous sectors and even more career paths available in clean energy and green technology fields.

Each profile also includes information on the training and educational requirements of each job and on potential compensation. Of course, for every job the background requirements and salary will vary widely based on a number of factors. Compensation levels in particular will depend on factors like location and experience. These details are offered only as indicators to give a sense of the job market.

Information for these job profiles was primarily compiled from the Governor's Energy Office report, "Defining, Estimating, and Forecasting the Renewable Energy and Energy Efficiency Industries in the U.S. and Colorado," and the "Green Jobs Guidebook," authored by Environmental Defense Fund in partnership with the Ella Baker Center for Human Rights.²

Where can I find additional information on job training and placement?

For those looking for additional information, the Governor's Energy Office website contains a wide range of resources on green jobs in Colorado, available here:

<http://www.colorado.gov/energy/index.php?/resources/category/colorado-green-jobs/>

For job-seekers interested in jump-starting their path towards a high quality New Energy Economy career, a variety of professional training and job placement programs are available in Colorado that can help you land a job and reach professional goals. The Governor's Energy Office website details training and job placement assistance resources in different regions in Colorado. For more information, visit:

<http://www.colorado.gov/energy/index.php?/resources/category/green-jobs-resources/>

New and returning workers can use this handbook with these additional resources to identify potential careers and find the training and job placement assistance to help land the job. Together, these resources can help job-seekers find a career in Colorado's New Energy Economy.

Energy Efficient Construction

A cornerstone of building Colorado's New Energy Economy will be retrofitting inefficient existing buildings as well as constructing new, energy efficient buildings. Energy efficient building practices are time and labor intensive, creating job opportunities for a variety of careers, from electricians or engineers, to roofers or architects. Many of these careers are open to workers without college degrees.³ The Colorado Governor's Energy Office estimated that the largest number of jobs created in the renewable energy and energy efficiency sectors in Colorado will be related to energy efficient construction⁴ and that by 2030, energy efficient construction may account for up to 30% of all energy efficiency-related jobs in Colorado.⁵

Lighting & HVAC Energy Engineer

Description: Provide a full range of technical services related to energy efficiency, renewable energy, carbon emissions reductions and cogeneration projects

Average Salary: \$77,000/year

Min. Educational Req.: Bachelor's Degree in Engineering or related field

Recommended College Coursework: Engineering, Energy Efficient Building, HVAC and Lighting systems, Green Building Design

Experience Needed: Mid to High Level
Minimum 3 years of energy engineering experience in the identification and evaluation of energy efficient measures

Employer Type: Private Firms

Related Careers:
1. Energy Engineer

HVAC Engineer

Description: Design and install all types of air conditioning, heating and ventilation systems, building automation systems and hot water heating

Average Salary: \$78,000/year

Min. Educational Req.: Trade School, Apprenticeship or Associate's Degree

Recommended Coursework: Mechanical Engineering, HVAC controls

Experience Needed: High Level
Journey Level plus 5 years related experience.

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:
1. Refrigeration Engineer
2. Energy Engineer
3. HVAC Service Technician

Senior HVAC Engineer

Description: Coordinate HVAC equipment, ductwork and piping layouts with architectural/structural designs to prevent conflict during construction; help ensure compliance with relevant building codes

Average Salary: \$90,000/year

Min. Educational Req.: Bachelor of Science in Mechanical Engineering

Recommended College Coursework: Mechanical Engineering, HVAC, Building Design

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
10 years working with a consulting engineering firm as an HVAC engineer, or with a design-build mechanical contractor

Employer Type: Private Firms

Related Careers:
1. Environmental Construction Engineer

HVAC Maintenance/Repair Trainee

Description: Install and maintain heating, ventilation, and air conditioning equipment; test and repair environmental systems and repair or replace sealants, parts, and components

Average Salary: \$32,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry level

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:
1. HVAC Technician
2. HVAC Engineer

Energy Efficient Construction

HVAC Service Technician

Description: Maintain and repair all types of air conditioning, heating and ventilation systems

Average Salary: \$49,000/year

Min. Educational Req.: Trade School, Apprenticeship, or Associate's Degree

Recommended Coursework: HVAC controls

Certification: EPA HVAC certification
Commercial HVAC if necessary

Experience Needed: Mid-Level

Industrial Energy Field Auditor

Description: Conduct energy audits of industrial areas by visually checking HVAC equipment, ducts, windows and weather-stripping and by capturing data for future use

Average Salary: \$24,000/year

Min. Educational Req.: Bachelor's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

Recommended College Coursework: Environmental Studies, Industrial Operations

Experience Needed: Mid-Level
2 – 3 years in related field of auditing and/or energy efficiency sector

Employer Type: Private Firms

Residential Energy Field Auditor

Description: Conduct home energy audits in residential homes by visually checking HVAC equipment, lighting, ducts, windows and weather-stripping, and by identifying areas for improvement and making recommendations to homeowner

Average Salary: \$24,000/year

Min. Educational Req.: Associate's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

Recommended Coursework: Environmental Studies, Energy Management, Auditing

Certification: HERS Certification

Desired Education: Bachelor's Degree preferred

Experience Needed: Entry to Mid-Level

Employer Type: Private Firms, Public Utilities

Related Careers:

1. Auditing Services Sales Consultant
2. Energy efficiency consultant

Commercial Energy Field Auditor

Description: Conduct energy audits in commercial businesses by visually checking HVAC equipment, lighting, ducts, windows and weather-stripping, capturing data for future use, identifying areas of improvement, and making recommendations to business

Average Salary: \$24,000/year

Min. Educational Req.: Associate's Degree in Building Materials, Environmental Science, Environmental Studies, Energy Management

Recommended Coursework: Energy Management, Building Materials

Certification: HERS Certification

Desired Education: Bachelor's Degree preferred

Experience Needed: Entry to Mid-Level

Employer Type: Private Firms, Public Utilities

Related Careers:

1. HVAC Technician
2. Energy efficiency consultant

Employer Example: Johns Manville Corporation, Denver, CO

Johns Manville, a Denver-based company, demonstrates the wide variety of careers available in the Green Buildings sector. Johns Manville is an international manufacturer of building products with a range of business units, from manufacturing energy efficient roofing systems and insulation to research and design of new products.⁶ The company, an EPA Energy Star partner, helped retrofit and insulate the new offices for the Colorado Governor's Energy Office as part of Governor Ritter's 'Greening Government' goals.⁷ Johns Manville facilities in Colorado include its World Headquarters and an Insulation Systems center in Denver, as well as its Technical Center for product research and development in Littleton. Careers at these three facilities include jobs in sales, product manufacturing, and research and design.⁸ In total the company employs about 700 people throughout Colorado—a portion of its approximately 7,500 worldwide employees.⁹

Energy Efficient Construction

Auditing Services Sales Consultant

Description: Establish sales plans, prepare proposals and close client deals

Average Salary: \$60,000/year

Min. Educational Req.: Bachelor's Degree

Recommended College Coursework: Marketing, Sales, Sciences

Experience Needed: Mid-Level
2-5 years experience in commercial and/or in-home sales

Employer Type: Private Firms

Related Careers:
1. Energy Conservation Representative

Energy Conservation Representative

Description: Inspect homes of utility customers to identify conditions that cause energy waste and suggest actions to reduce waste

Average Salary: \$48,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry to Mid-Level
1-3 years related experience

Employer Type: Private Firms, Government

Related Careers:
1. Environmental Compliance Specialist
2. Energy Control Officer

Field Energy Consultant

Description: Identify opportunities for equipment and energy system retrofits at grocery stores and other retail sites

Average Salary: \$60,000/year

Min. Educational Req.: HS Diploma/GED

Recommended College Coursework: Marketing & Sales, HVAC, Mechanical Engineering

Experience Needed: Entry Level
1 – 2 years with consultant sales background and experience building a portfolio of clients

Desired Education: Familiarity with HVAC, lighting and/or refrigeration

Employer Type: Private Firms

Related Careers:
1. Sales Representative

Residential Green Building & Retrofit Architect

Description: Design residential buildings that meet LEED qualifications as well as develop retrofits for current structures

Average Salary: \$91,000/year

Min. Educational Req.: Bachelor's Degree in Architecture

Recommended College Coursework: Architecture, Civil Engineering, Drafting, Retrofitting

Certification: LEED-accredited professional

Experience Needed: High Level

Employer Type: Private Firms

Related Careers:
1. Civil Engineer

Industrial Green Systems & Retrofit Designer

Description: Design energy efficient and retrofit structures for industrial buildings

Average Salary: \$91,000/year

Min. Educational Req.: Bachelor's Degree in Architecture

Recommended College Coursework: Architecture, Industrial Building

Certification: LEED-Certified Builder

Experience Needed: High Level
5-8 years experience

Employer Type: Private Firms

Related Careers:
1. Structural Engineer

Commercial Green Building & Retrofit Architect

Description: Participate in all phases of design for commercial and educational buildings

Average Salary: \$91,000/year

Min. Educational Req.: Bachelor's Degree in Architecture

Recommended College Coursework: Architecture, Drafting, Energy Efficiency

Certification: LEED-Certified Builder

Experience Needed: High Level
Minimum 5 years experience

Employer Type: Private Firms

Related Careers:
1. Civil Engineer

Energy Efficient Construction

Energy Procurement Manager & Analyst

Description: Analyze energy efficient measures and conduct audits in industrial and large commercial facilities

Average Salary: \$83,000/year

Min. Educational Req.: Bachelor's Degree in Energy Analysis, Sciences or Business Administration

Recommended College Coursework: Business Administration, Sciences, Energy Analysis, Energy Efficiency methods

Experience Needed: Mid to High Level
3-5 years as an energy analyst in an energy efficiency technical discipline

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Field Energy Consultant
2. Energy Conservation Representative

Site Supervising Technical Operator

Description: Manage and ensure uniform application and technical correctness during construction

Average Salary: \$45,000/year

Min. Educational Req.: College degree in Engineering or related field

Recommended College Coursework: Mechanical/ Electrical Engineering

Experience Needed: Mid to High Level
Minimum 5 years experience in a supervisory role

Employer Type: Private Firms

Related Careers:

1. Safety Technical Specialist

Residential Air Sealing Technician

Description: Develop and implement effective air sealing techniques and applications

Average Salary: \$31,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
Residential construction or work on an insulation crew is a plus

Desired Education: Trade School or Apprenticeship

Employer Type: Private Firms

Related Careers:

1. HVAC Trainee

Energy Efficiency Finance Manager

Description: Project-management role in energy efficiency projects and policies, also conducts relevant market analysis and research

Average Salary: \$83,000/year

Min. Educational Req.: Bachelor's Degree in Accounting, Finance, Business Administration

Recommended College Coursework: Economics, Environmental Studies, Public Policy, Finance, Accounting

Experience Needed: High Level
8 or more years in related field with supervisory responsibilities

Desired Education: MBA

Employer Type: Private Firms

Related Careers:

1. Financial Officer

Field Technician

Description: Install, maintain and repair facilities; can also include commissioning advanced energy management and control systems, controls programming and controls sales

Average Salary: \$57,000/year

Min. Educational Req.: Trade School or Apprenticeship

Experience Needed: Entry to Mid-Level
Master or Journey level. Should have HVAC, electrical and or automation and controls installation and service experience
1-3 years of related experience and/or training; or equivalent combination of education and experience

Employer Type: Private Firms, Government, Power Plants/Facilities

Insulation Installer

Description: Responsible for pasting, wiring, taping or spraying insulation onto a variety of structures and surfaces to exclude or retain heat

Average Salary: \$20,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
1-3 month related experience

Employer Type: Private Firms

Related Careers:

1. Carpenter

Energy Efficient Construction

Machinist

Description: Make precision metal or plastic parts, operate computer numerically controlled machine tools, and set up and operate all of the basic machine tools and many specialized variations

Average Salary: \$30,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Metalworking, Drafting, Math and Computer courses

Experience Needed: Mid-Level
Journey level status

Employer Type: Power Plants/Facilities

Related Careers:

1. Welder
2. Sheet Metal Worker

Welder

Description: Operate manual, semiautomatic, and automatic arc and gas equipment, and fabricate and repair machine parts, motors, trailers and manufacturing equipment

Average Salary: \$30,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Welding, Machine Shop, Math, Drafting, Physics, Chemistry, and Engineering

Certification: Various certifications dealing with different materials and uses

Experience Needed: Entry to Mid-Level

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Machinist
2. Sheet Metal Worker

Home Improvement Retrofit Trainee

Description: Install energy efficient products for in-home retrofits, run safety tests on gas appliances and identify home energy reduction measures

Average Salary: \$30,000/year

Min. Educational Req.: High School Diploma/GED

Experience Needed: Entry Level
Experience in door, window, sheetrock repair and replacement helpful

Employer Type: Private Firms

Related Careers:

1. HVAC Maintenance Trainee
2. Environmental Compliance Specialist

Carpenter

Description: Work in almost every type of construction: jobs include reading plans, identifying and locating materials, measuring and marking, assembly and installation, and operating hand tools and power equipment.

Average Salary: \$35,000 - \$40,000/year depending on experience

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Math, Drafting, and Shop courses

Experience Needed: Entry to Mid-Level
Journey Level status

Employer Type: Private Firms

Related Careers:

1. Roofers

Roofing & Skylight Installer

Description: Install skylights and other energy efficient roof ventilation systems

Average Salary: \$53,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Carpentry, Roofing, Energy Efficiency

Experience Needed: High Level
5-7 years related roofing and framing experience

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Carpenters

Electrical System Installer

Description: Plan, lay out, install, repair, and maintain electrical equipment that provides light, heat, communications and power, and install electrical wires, cables and conduit systems

Average Salary: \$44,000/year

Min. Educational Req.: Apprenticeship or Trade Schools

Recommended Coursework: Electric Installation courses

Experience Needed: Mid-Level
Journey Level status

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Lighting Engineer

Energy Efficient Construction

Water Systems Designer & Engineer

Description: Design and install energy efficient water systems in residential and commercial settings

Average Salary: \$37,000/year

Min. Educational Req.: Trade School or Apprenticeships

Recommended Coursework: Plumbing, Pipefitting, Energy Efficiency, Mechanical Engineering

Certification: Professional Engineer (P.E.)

Experience Needed: Mid-Level

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Plumber

Green Plumber & Pipefitter

Description: Install sinks, tubs, and other fixtures and their connection to water and sewage systems; maintain existing plumbing systems

Average Salary: \$60,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Plumbing, Pipefitting, Energy Efficiency

Experience Needed: Mid-Level
Journey Level status

Employer Type: Private Firms, Government

Related Careers:

1. Water Purification

Weatherization Operations Manager

Description: Manage day-to-day weatherization activities to ensure that production goals are met, and supervise the activities of Installers, Assessors and Weatherization office staff

Average Salary: \$80,000/year

Min. Educational Req.: None Specified

Experience: High Level
2 yrs experience in construction supervision and/or management. Technical and functional skills in building trades

Employer Type: Private Firms

Related Careers:

1. Construction Foreman

Building Maintenance Engineer

Description: Effectively and efficiently operate and maintain all HVAC and MEP equipment, serve as a systems operator and perform and supervise maintenance work

Average Salary: \$65,000/year

Min. Educational Req.: HS Diploma/GED, Trade School or Apprenticeship

Recommended Coursework: HVAC Maintenance, Energy Auditing

Experience Needed: Entry to Mid-Level
2-3 years experience in commercial HVAC and in operating large tonnage chill plant

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. HVAC Engineer

Employer Example: Alpen Energy Group, Boulder, CO

Alpen Energy Group LLC is a major producer of high performance insulating windows for office buildings, schools, shopping malls, and home residences. The company's fiberglass windows were named one of 2007's Top Ten Green Building Products by BuildingGreen.¹⁰ Alpen's energy efficient windows have been installed at the Jefferson County Courthouse, the Boulder Public Library, and the Loveland City Center, among many other locations in Colorado and worldwide.¹¹ In recent years, the company has experienced steady, rapid growth, with annual revenue increasing by at least 60% in 2006, 2007, and 2008.¹² The 28 year old company employs approximately 25 full time staff members in Colorado, working in sales, design and manufacturing.¹³

Energy Efficient Construction

Energy Consultant

Description: Assess industry trends and related implications, monitor product developments and preferences, explore competitive landscapes and examine emerging technologies

Average Salary: \$81,000/year

Min. Educational Req.: Advanced Degree

Recommended College Coursework: Energy, with focus on any or all efficient technologies and practices

Experience Needed: High Level

Employer Type: Private Firms, Government, Education

Related Careers:

1. Environmental Scientist

Civil Engineer

Description: Oversee design, construction and maintenance of green buildings; work with project managers to build projects within design specifications

Average Salary: \$72,000/year

Min. Educational Req.: Bachelor's degree in Civil Engineering

Recommended College Coursework: Engineering, Land Use, Green Building

Certification: Professional Engineer (PE) or Engineer in Training (E.I.T.)

Desired Education: Master's Degree

Experience Needed: High Level
Most projects require experience of 2 – 5 years

Employer Type: Private Firms, Government

Related Careers:

1. Energy Efficient Engineer
2. Construction

Environmental Construction Engineer

Description: Project manager for an environmental construction project

Average Salary: \$115,000/year

Min. Educational Req.: Bachelor's Degree in Civil Engineering

Recommended College Coursework: Environmental Construction, Civil Engineering

Certification Requirements: Licensed Civil Engineer

Experience Needed: High Level
12 plus years experience in civil engineering with at least 5 years experience in a management role

Employer Type: Private Firms, Government

Refrigeration Engineer

Description: Design and install refrigeration units and maintain and repair controls

Average Salary: \$74,000/year

Min. Educational Req.: Bachelor's Degree in Engineering or equivalent Trade School/Apprenticeship

Recommended College Coursework: Mechanical Engineering, Refrigeration controls

Experience Needed: Mid to High Level

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. HVAC Engineer

Energy Engineer

Description: Perform site-specific engineering analysis and evaluation of energy efficiency involving residential, commercial and industrial customers by using building simulation software

Average Salary: \$71,000/year

Min. Educational Req.: Bachelor's Degree in engineering discipline

Recommended College Coursework: Engineering, Physics

Certification Requirements: Professional Engineer, Engineer-In-Training, and/or Certified Energy Manager (CEM) desired.

Experience Needed: High Level
3-10 years related experience or training or equivalent combination of education and experience or
2-5 years of experience within the green building, energy efficiency, building science or related field

Desired Education: Master's degree a plus

Employer Type: Private Firms

Engineering Intern

Description: Assist Electrical Engineer with LEED certification projects

Average Salary: \$6,000/year

Min. Educational Req.: HS Diploma/GED, Some College

Recommended College Coursework: Physics, Electrical Engineering

Experience Needed: Entry Level
Hands-on laboratory experience with electronics equipment, physics laboratory, optical equipment and electronics fabrication

Desired Education: Working for B.S. or M.S. degree in Physics or Electrical Engineering

Employer Type: Private Firms

Energy Efficient Construction

Electrical Engineer

Description: Electrical Engineer with a LEED-certified, sustainable, Green-building MEP and Architectural firm

Average Salary: \$72,000/year

Min. Educational Req.: Bachelor's degree in Electrical Engineering

Recommended College Coursework: Electrical Engineering

Certification: Professional Engineer (P.E.)

Experience Needed: High level
4-7 years Electrical Engineering experience in an MEP or construction firm

Employer Type: Private Firms

Related Careers:

1. Civil Engineer

Structural Design Engineer

Description: Analyze and design structural elements and systems for buildings in accordance with building code and design standards; prepare construction documents and specifications for structural systems

Average Salary: \$75,000/year

Min. Educational Req.: Master's Degree in Structural Engineering

Recommended College Coursework: Structural and Seismic Engineering

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
3-6 years experience and competence in structural analysis programs

Employer Type: Private Firms, Government

Wind Power

Colorado has already established itself as a leader in U.S. wind power generation and manufacturing, creating jobs along the entire wind power supply chain.

Colorado hosts some of the largest wind farms in the United States and also has world class wind resources available for further development. Colorado's numerous wind farms on the Eastern Plains create construction and project design jobs when the enormous wind turbines are installed, as well as long-term operation and maintenance jobs overseeing the wind farm. Colorado's windy plains host numerous opportunities for further wind power development: in 2007, eight new Renewable Resource Generation Development Areas were identified in-state with the potential for development of over 96 GW of wind power capacity, eight times Colorado's current peak electricity use.¹⁴

Colorado's leadership in wind power has encouraged major wind manufacturers to locate in-state. Most notably, Vestas, a leading wind turbine manufacturer, is in the process of opening four major factories in Colorado: a blade factory in Windsor, a tower factory in Pueblo, and a blade factory and nacelle factory in Brighton.¹⁵ Vestas expects to employ 2,500 people in Colorado by the end of 2010.¹⁶ Numerous other wind firms, from Siemens Wind Power, a wind turbine manufacturer, to Hexcel Corporation, a wind turbine component supplier, are also locating in Colorado and creating job opportunities in wind turbine design, manufacturing, and sales.

The wind power sector is a major employer in Colorado.¹⁷ Proposed and under construction manufacturing facilities along the Front Range as well as further wind development on the Eastern Plains will create additional opportunities in this sector.

Wind Turbine Sheet Metal Worker

Description: Perform all operations necessary to make, install and repair a wide variety of sheet-metal products related to wind turbine production

Average Salary: \$33,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Math, Mechanical Drawing, Metal Shop, Welding, Heating and Air-Conditioning

Experience Needed: Entry to Mid-Level
Journey level status

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Machinist
2. Welder

Wind Turbine Electrical Engineer

Description: Responsible for design, development and testing of all aspects of electrical components and equipment.

Average Salary: \$87,000/year

Min. Educational Req.: Bachelor's Degree in Electrical Engineering

Recommended College Coursework: Electrical Engineering, Renewable Energies

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
5 years with similar responsibilities

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Energy Engineer
2. Photovoltaic Design Engineer

Wind Power

Wind Turbine Machinist

Description: Make precision metal or plastic parts, use computer numerically controlled machine tools and set up and operate all of the basic machine tools and many specialized variations for wind turbine production

Average Salary: \$30,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended Coursework: Metalworking, Drafting, Math, and Computer courses

Experience Needed: Entry to Mid-Level
Journey level status

Employer Type: Power Plants/Facilities

Related Careers:

1. Welder
2. Sheet Metal Worker

Wind Power Plant Project Engineer

Description: Responsible for overseeing all aspects of the technical specialties at plants including electrical engineering, turbine selection & procurement, revenue generation, expense management and budgets, as well as conducting conceptual engineering and design of wind field processes and facilities

Average Salary: \$69,000/year

Min. Educational Req.: Bachelor's degree in Mechanical or Electrical Engineering.

Recommended College Coursework: Mechanical and/or Electrical Engineering, Renewable Energies

Experience Needed: High Level
5-10 years of experience with power plant design, maintenance and operations

Employer Type: Power Plants/Facilities

Related Careers:

1. Director of Wind Development

Wind Turbine Mechanical Engineer

Description: Responsible for design, development, testing of all aspects of mechanical components, equipment and machinery.

Average Salary: \$87,000/year

Min. Educational Req.: Bachelor's Degree in Mechanical Engineering

Recommended College Coursework: Mechanical Engineering, Metal Shop, Machinery

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
5 years with similar responsibilities

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Energy Engineer

Director of Wind Development

Description: Lead and manage the development and evaluation of potential wind energy business opportunities; identify and analyze wind energy investment opportunities; and lead projects through the research, analysis, modeling, recommendation and negotiating phases

Average Salary: \$138,000

Min. Educational Req.: Bachelor's degree in Accounting, Finance, Economics, or related field

Recommended College Coursework: Finance, Economics, Accounting, Management

Experience Needed: High Level
4-6 years wind developer experience with large company or consulting firm

Desired Education: MBA, CPA, CMA

Employer Type: Private Firms, Power Plants/Facilities

Employer Example: Hexcel Corporation, Windsor, CO

Hexcel Corporation is a leading manufacturer of the advanced composite materials that are an important part of today's giant wind turbines.¹⁸ In February 2009, Hexcel broke ground on a 100,000 square foot manufacturing facility in east Windsor that the company expects will begin production in the second half of 2009.¹⁹ An example of the ripple effect of renewable energy development, this facility will supply component parts and materials to Vestas, a wind manufacturer which recently opened a turbine plant in Windsor.²⁰ Vestas' continued expansion increases the likelihood that additional component suppliers like Hexcel will locate in Colorado, providing more job opportunities for Coloradans. Production of wind turbine components requires similar qualifications as other skilled manufacturing careers, with positions including machinists, engineers and quality control managers.²¹

Wind Power

Wind Farm Electrical Systems Designer

Description: Design underground and overhead wind farm collector systems and prepare and develop site specifications.

Average Salary: \$60,000/year

Min. Educational Req.: Bachelor's Degree

Recommended College Coursework: Electrical Systems, Wind Turbine Design

Experience Needed: High Level
Minimum 5 years experience including wind farm collector systems and/or electric utility distribution

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Electrical Engineer

Wind Field Operations Manager

Description: Provide overall leadership to drive execution of all site activities - receiving, installation & commissioning - while maintaining expertise in environmental, health, safety and quality procedures and ensuring project goals including cost, schedule and performance

Average Salary: \$48,000/year

Min. Educational Req.: Bachelor's Degree

Recommended College Coursework: Renewable Energies, Engineering, Industrial Operations

Experience Needed: Mid to High Level
Minimum 3 years in field management of wind farms plus 1-2 years direct technical experience on wind farms

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Plant Operations Manager

Electro-Mechanical Wind Turbine Technician

Description: Responsible for the installation, maintenance and commissioning of wind turbines

Average Salary: \$35,000/year

Min. Educational Req.: Associate's degree or equivalent from Trade School
OR, six months to one year related experience and/or training
OR, equivalent combination of education and experience

Recommended College Coursework: Electrical/ Mechanical Engineering

Experience Needed: Entry to Mid-Level

Employer Type: Private Firms, Government, Power Plant/Facilities

Related Careers:

1. Wind Generating Installer
2. Wind Field Technician

Wind Field Technician

Description: Troubleshoot and repair complex problems on variable speed/variable pitch wind turbines

Average Salary: \$26,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
1-2 years experience desired

Desired Education: Basic math skills in all units of measure using whole numbers, common fractions and decimals

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Electro-Mechanical Wind Turbine Technician
2. Wind Generating Installer

Wind Field Service Technician

Description: Perform status checks on turbines and repair any problems

Average Salary: \$44,000/year

Min. Educational Req.: Trade School or Apprenticeship

Recommended College Coursework: Iron and/or Metal shop, Mechanical/Electrical Engineering, Renewable Energy Studies

Experience Needed: Mid-Level

Employer Type: Power Plants/Facilities

Related Careers:

1. Electro-Mechanical Wind Turbine Technician

Wind Generating Installer

Description: Assemble, install, and maintain electrical and mechanical parts, such as alternators, generators, and rotors of electric power generating windmills, according to production specifications

Average Salary: \$31,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry to Mid-Level
A combination of more than 4 years of directly related training and/or experience is typically required

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Electro-Mechanical Wind Turbine Technician
2. Wind Field Technician

Wind Power

Junior Renewable Energy Technician

Description: Perform wind turbine resets and site call outs and act as a central safety call in for project managers performing high voltage switching, while receiving on-site training

Average Salary: \$30,000/year

Min. Educational Req.: No degree required

Recommended College Coursework: Electro-Mechanical, Wind Power Generation

Experience Needed: Entry Level
Previous operations experience of wind plants or currently attending school for this particular field

Desired Education: Trade School or Apprenticeship

Employer Type: Power Plants/Facilities

Related Careers:

1. Wind Field Technician
2. Electro-Mechanical Wind Turbine Technician

Solar Power

The solar power sector has great potential in sunny Colorado. In recent years, the solar sector has been one of the fastest growing renewable energy sectors in Colorado.²² For example, Abound Solar Inc., a solar panel manufacturing company that got its start in a Colorado State University laboratory, is currently constructing a manufacturing plant in Northern Colorado that the company predicts will bring its Colorado employee total to as many as 500 people.²³ Ascent Solar recently opened its world headquarters and enlarged manufacturing facilities in Thornton while Abengoa, a Spanish renewable energy company, recently established the North America headquarters of its solar power division in Lakewood.²⁴ Across Colorado, numerous companies design and install residential and commercial solar power systems, creating additional exciting career opportunities. Continued support for solar power and Colorado's top-notch solar resources are likely to lead to further opportunities in the solar power sector.

Solar Energy System Installer

Description: Install and repair solar energy systems designed to collect, store and circulate solar-heated water or other medium for residential, commercial or industrial use

Average Salary: \$31,000/year

Min. Educational Req.: HS Diploma/GED

Certification: Solar Thermal Installer recommended

Experience Needed: A combination of more than 2 years of directly related training

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Cell Device Technician
2. Electrician

Solar Energy System Installer Assistant

Description: Assist solar energy system installer in installing and repairing solar energy systems for residential, commercial or industrial use

Average Salary: \$23,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Fabrication Technician
2. Solar Energy System Installer

Solar Residential Installation Electrician

Description: Hardwire the PV energy system to the power grid

Average Salary: \$44,000/year

Min. Educational Req.: HS Diploma/GED

Certification: North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

Experience Needed: Entry to Mid-Level
Assumes Journey level Electrician but does not need solar experience

Desired Education: Associate's Degree, Trade School or Apprenticeship

Employer Type: Private Firms, Government

Related Careers:

1. Electrician

Solar Residential Installation Electrician Foreman

Description: Coordinate, direct and manage solar electric generating systems at residential customer sites

Midrange Salary: \$25-\$40/hour

Min. Educational Req.: HS Diploma/GED

Recommended Certification: North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

Experience Needed: Mid to High Level
Journey Level Attained - Minimum 3-5 years of Solar Installation

Desired Education: Associate's Degree or equivalent from Trade School or Apprenticeship

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Energy System Installer
2. Commercial Installation Electrician

Solar Power

Solar Commercial Installation Electrician Foreman

Description: Coordinate, direct and manage solar electric generating systems at commercial customer sites

Average Salary: \$58,000/year

Min. Educational Req.: Trade School or Apprenticeship

Recommended Coursework: Solar or Renewable Energy Classes

Certification: North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

Experience Needed: Mid to High Level
Journey Level Attained - 3 -5 years direct experience in a construction environment in a similar capacity and carpentry and/or roofing experience is required

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Residential Installation Electrician

Solar Commercial Installation Engineer

Description: Responsible for installing solar panel systems on commercial structures. Works with blueprints and technical concerns in installation

Average Salary: \$75,000/year

Min. Educational Req.: Bachelor's Degree in Electrical Engineering

Recommended College Coursework: Solar, Electrical Engineering

Recommended Certification: North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

Experience Needed: High Level
Established Engineer with experience in Solar Installation

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Residential Installation Engineer
2. Electrical Engineer

Solar Commercial Installation Electrician

Description: Install solar electric generating systems at commercial customer sites

Midrange Salary: \$19-\$25/hour

Min. Educational Req.: HS Diploma/GED

Recommended Certification: North American Board of Certified Energy Practitioners (NABCEP) Certified Solar PV Installer

Experience Needed: Entry to Mid-Level
Journey level status expected

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Energy Efficiency Electrician

Solar Commercial Installation Engineering Technician

Description: Provide technical support and assistance to field technicians and engineers

Average Salary: \$47,000/year

Min. Educational Req.: Associate's degree or equivalent from Trade School or Apprenticeship

Recommended Coursework: Solar Installation, Electrical Engineering

Experience Needed: Mid-Level

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Lab Technician
2. Commercial Installation Engineer

Employer Example: Solar Worx, LLC, Durango, CO

Solar Worx, a small solar company in Durango, gives a picture of the kinds of jobs available with commercial and residential solar installation companies located throughout Colorado. Solar Worx's six employees design customer-specific solar systems, help customers apply for tax credits and rebates, install photovoltaic and solar thermal systems, and offer consulting services on solar system installation.²⁵ The company is currently working on several large projects, including both solar thermal and solar PV as well as residential and commercial projects. One project is a system that will produce 32,000 Watts of energy on the roof of Mercury Payments Processing, one of the largest businesses in Durango.²⁶ Solar Worx is a relatively young company, and thus far has experienced expansive growth. As more government entities, such as schools, move towards solar, Solar Worx expects more growth in the future.²⁷

Solar Power

Solar & PV Installation: Roofer

Description: Install solar systems on roof while ensuring that system is air-tight and does not compromise the structural integrity of building

Midrange Salary: \$14- \$25/hour

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
1-3 years related on-the-job experience

Desired Education: Trade School or Apprenticeship

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:
1. Construction

Solar Energy Engineer

Description: Perform site-specific analysis and evaluation of solar projects involving residential, commercial and industrial customers by utilizing building simulation software

Average Salary: \$71,000/year

Min. Educational Req.: Bachelor's Degree in an Engineering discipline

Recommended College Coursework: Engineering, Physics

Certification: Professional Engineer, Engineer-In-Training, and/or Certified Energy Manager (CEM) are desired

Experience Needed: High Level
3-10 years related experience/training
3-5 years of facility-related engineering experience
2-5 years of experience within the green building, energy efficiency, building science or related field.

Desired Education: Master's degree

Employer Type: Private Firms

Solar Operations Engineer

Description: Work with integration partners to design solar facilities and be an expert on solar technology and innovation

Average Salary: \$87,000/year

Min. Educational Req.: HS Diploma/GED

Recommended College Coursework: Electrical Engineering, Solar Operations

Recommended Certification: Professional Engineer (P.E.) NABCEP certificate and/or Electrical Contractors licenses

Experience Needed: High Level
Have experience designing and building PV electrical generation systems

Desired Education: Bachelor's Degree in Electrical Engineering Preferred

Employer Type: Private Firms, Government, Power Plants/Facilities

Residential/Commercial Solar Sales Consultant

Description: Establish sales plans, prepare proposals and close client deals

Average Salary: \$50,000 - \$80,000/year – varies due to commission

Min. Educational Req.: Bachelor's Degree

Recommended College Coursework: Marketing, Sales, Sciences

Experience Needed: Mid-Level
2-5 years experience in commercial and/or in-home sales.

Employer Type: Private Firms

Related Careers:
1. Energy Conservation Representative

Solar Energy Systems Designer

Description: Designs solar domestic hot water and space heating systems for new and existing structures, applying knowledge of energy requirements of structure, local climatological conditions, solar technology and thermodynamics

Average Salary: \$47,000/year

Min. Educational Req.: Trade School or Apprenticeship

Recommended College Coursework: Shop Math, Mechanical Drawing, Physics, Electronics, Solar Theory, Design

Experience Needed: Mid to High Level
Knowledge of solid-state equipment controls, microelectronics, plumbing and electrical training

Employer Type: Private Firms, Government, Power Plants/Facilities

ICE Technician (Instrumentation/Controls/Electrical Systems)

Description: Monitor and repair the instrumentation, controls, and electrical systems in a utility scale solar power generating facility

Average Salary: \$35,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Mid-Level
2-3 years experience with increasing responsibilities in troubleshooting and repair of plant instruments

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:
1. Installation Engineer

Solar Power

Solar Thermoelectric Plant Project Manager

Description: Oversee and manage a solar thermoelectric plant

Average Salary: \$75,000/year

Min. Educational Req.: Trade School, Apprenticeship or Bachelor's Degree

Recommended College Coursework: Electrical, Electronic and/or Energy Engineering

Certification: Professional Engineer (P.E.)

Experience Needed: Mid to High Level
Minimum 2 years working experience, familiarity with thermoelectric technology as well as the solar energy market

Employer Type: Power Plants/Facilities

Related Careers:

1. Solar Operations Engineer

PV Solar Cell Designer

Description: Design concentrated photovoltaic solar cells for mass production

Average Salary: \$77,000/year

Min. Educational Req.: Advanced Degree in Electrical Engineering, Materials Science, Chemistry, Physics or related

Recommended College Coursework: Engineering, Sciences, Renewable Energies

Experience Needed: High Level
Minimum 5 years of industry experience, solar experience not required.

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Solar Energy Systems Designer
2. Electrical Engineer

Solar Hot Water Heater Manufacturing Technician

Description: Manufacture solar hot water heaters.

Midrange Salary: \$16-18/hour

Min. Educational Req.: Associate's Degree in Electronics/Electrical Engineering, Material Science, Physics, Chemistry or related discipline OR equivalent training and work experience

Recommended College Coursework: Engineering, Sciences, Solar Technology

Experience Needed: Entry Level

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. PV Fabrication and Testing Technician

Solar Fabrication Technician

Description: Fabricate and assemble solar panels and arrays using machine shop tools and equipment

Average Salary: \$23,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
A combination of 3 – 6 months of directly related training and/or experience is typically required

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Energy System Installer
2. Solar and PV installation: Roofer

PV Fabrication & Testing Technician

Description: Test and fabricate flexible, translucent plastic solar cells which generate energy from the sun

Average Salary: \$45,000/year

Min. Educational Req.: Associate's Degree in Electronics/Electrical Engineering, Material Science, Physics, Chemistry or related discipline OR equivalent training and work experience

Recommended College Coursework: Electronics, Electrical Engineering, Chemistry, Solar, Physics, Material Science

Experience Needed: Entry Level
2 years work experience in a laboratory environment is highly desirable

Employer Type: Private consulting, Government, Power Plants/Facilities

Solar Lab Technician

Description: Perform a variety of tests on solar devices, examine test samples and read blueprints, diagrams, instruments and operational instructions

Average Salary: \$41,000/year

Min. Educational Req.: Associate's Degree in related field

Recommended College Coursework: Physics, Chemistry, Mechanical/Electrical Engineering, Solar

Experience Needed: Entry Level
Demonstrated ability to perform all common laboratory tests, record lab results, and provide feedback

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Solar Energy Systems Designer
2. PV Power Systems Designer

Recycling and Waste Management

Every community needs sustainable options to reduce, reuse and manage their municipal waste. Because of the ubiquitous need for waste management, recycling, reuse, and remanufacturing companies employ large numbers of workers throughout the state and are one of the largest sectors of the green economy. In 2007, Colorado hosted an estimated 8,800 jobs in the recycling, reuse and remanufacturing sector.²⁸ Additional population growth and economic growth in Colorado is predicted to steadily increase employment in this sector.²⁹

Recycling Collections Driver

Description: Drive collection route and pick up recycling from designated locations

Average Salary: \$20,000/year

Min. Educational Req.: None

Experience Needed: Entry Level
Must have a driver's license

Employer Type: Private firms, Government

Related Careers:

1. Recycling Center Operator

Recycling Center Operator

Description: Perform daily operations at a Recycling Center, including processing materials and customer service; hand sorts and separates recyclable from non-recyclable materials according to established procedures

Average Salary: \$27,000/year

Min. Educational Req.: None

Experience Needed: Entry Level
1 year as general laborer

Employer Type: Private Firms, Government

Related Careers:

1. Recycling Collections Driver

Hazardous Waste Management Specialist

Description: Conduct studies on hazardous waste management projects; provide information on treatment and containment of hazardous waste; provide technical assistance in event of hazardous chemical spill by identifying pollutant, determining hazardous impact and recommending corrective action

Average Salary: \$55,000/year

Min. Educational Req.: College Degree in Chemistry or other Science

Recommended College Coursework: Analytical Chemistry, Organic Chemistry, and Physical Chemistry

Experience Needed: Mid-Level
2 years in a comprehensive environmental, health and safety program

Employer Type: Private Firms, Government, Plants/Facilities

Related Careers:

1. Hazardous Materials Removal Worker
2. Nuclear Waste Management Engineer

Solid Waste Engineer / Manager

Description: Manage solid waste projects, including planning, operations and technology development

Average Salary: \$74,000/year

Min. Educational Req.: Bachelor's degree in Engineering or Environmental Studies

Recommended College Coursework: Engineering, Green building, Cogeneration, Auditing, Water efficiency

Certification: E.I.T. – Engineer in Training

Experience Needed: Mid to High Level
2-5 years experience in performing engineering and economic analyses for energy efficiency or solid waste management projects and/or programs

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Wastewater Engineer

Recycling and Waste Management

Operations Maintenance Worker for Water Services

Description: Responsible for repairing water mains, services, general maintenance and other duties

Average Salary: \$36,000/year

Min. Educational Req.: HS Diploma/GED

Certification Requirements: Grade II Distribution certification desired or must have or obtain Grade II Distribution cert. within 10 months

Experience Needed: Entry Level

Employer Type: Government, Power Plants/Facilities

Related Careers:

1. Wastewater Engineer

Water Resource Engineer

Description: Prepare environmental documentation for water resources, regulatory program compliance, data management and analysis and site reviews

Average Salary: \$64,000/year

Min. Educational Req.: Bachelor's Degree in Environmental Science/Studies, Engineering, Chemistry, Hydrology, or related field

Recommended College Coursework: Hydrology, Stormwater, Wastewater, Environmental Studies/ Sciences

Experience Needed: High Level

Experience in water quality compliance, permitting, and associated technical document preparation

Employer Type: Private Firms, Government

Wastewater Plant Civil Engineer

Description: Project manager for wastewater design and implementation, responsible for all facets of hydraulic modeling and pipeline design

Average Salary: \$72,000/year

Min. Educational Req.: Bachelor's Degree in Civil Engineering

Recommended College Coursework: Civil Engineering, Mechanical Engineering, Wastewater management

Certification: Professional Engineer (P.E.)

Experience Needed: High Level

10 years experience in Civil Design

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Civil Engineer
2. Wastewater Plant Operator

Wastewater Engineer in Industrial Facilities

Description: Administer the stormwater/wastewater program for major industrial facilities; prevent spills and stormwater pollution

Average Salary: \$81,000/year

Min. Educational Req.: Bachelor's Degree in Chemical, Petroleum, Mechanical or Environmental Engineering

Recommended College Coursework: Chemistry, Mechanical Engineering, Water/Waste Water treatment

Experience Needed: High Level

Minimum 5 years related experience

Employer Type: Plants/Facilities

Employer Example: Curbside Recycling Indefinitely, Inc., Grand Junction, CO

Curbside Recycling Indefinitely, Inc. (GJ CRI), is one example of the locally owned and operated recycling companies located in many communities throughout Colorado. GJ CRI offers residential curbside recycling and commercial recycling in partnership with the city of Grand Junction under the direction of the Solid Waste Management Department.³⁰ The company is experiencing steady growth in customers as well as product offerings: in 2008, GJ CRI gained 519 new residential customers, and in 2009 hopes to gain 240 more residential customers. GJ CRI is also continuing to expand its drop off recycling services and its electronics and facility infrastructure, with the objective of increasing the facility capacity from the current 3.5 million pounds of material per year to 9 million pounds per year.³¹ The small, family-owned business provides green recycling services for the community and also provides employment for twelve local residents. With its continued expansion, GJ CRI hopes to employ two to six new employees in 2009.³² Positions at GJ CRI include educational coordinator, office manager, facility manager, residential route supervisor, commercial route supervisor, residential route driver, and residential route assistant.³³

Recycling and Waste Management

Hazardous Materials Removal Worker

Description: Identify, remove, transport and dispose of various hazardous materials, including asbestos, lead and radioactive and nuclear materials

Average Salary: \$35,000 - \$42,000/year depending on experience

Min. Educational Req.: HS Diploma/GED

Certification Requirements: 1 – 3 months of training and licensure is required for each material to be handled

Experience Needed: Entry Level - Need Certification

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Hazardous Waste Management Specialist
2. Nuclear Waste Management Engineer

Waste Reduction Consultant

Description: Help design, implement and monitor a variety of commercial and municipal programs that include waste prevention, recycling, construction & demolition, household hazardous waste, illegal hauling and used oil programs

Average Salary: \$65,000/year

Min. Educational Req.: Bachelor's Degree in Waste Management and/or Energy Efficiency

Recommended College Coursework: Waste Reduction, Environmental Studies, Recycling

Experience Needed: High Level
5-7 years in related experience

Desired Education: Master's Degree or PhD

Employer Type: Private Firms

Related Careers:

1. Environmental Consultant

Advancing New Solutions

Colorado is a national leader in researching and developing new solutions for energy and environmental security. In particular, the National Renewable Energy Laboratory (NREL), located in Golden, provides significant employment opportunities while also developing new technologies to address pressing energy and environmental issues and stimulating the growth of renewable energy companies in Colorado.³⁴ The leadership of NREL and our other national labs, coupled with dynamic private sector companies, has made Colorado a leader in cutting edge clean energy technologies, generating jobs and opportunity throughout the state.

Smart Grid

Creating the electricity grid of the future will increase the efficiency of our power use and help us take advantage of Colorado's renewable energy resources. It will also create new jobs and career opportunities for Colorado citizens. For example, Tendril Networks Inc., a 'smart grid' company based in Boulder, offers career opportunities in designing, manufacturing and selling equipment to help homeowners and utilities track electricity use.³⁵

Power System Operator

Description: Monitor and operate equipment on transmission lines and in transformer and power generation stations, and control the distribution and regulate the flow of electrical power in the transmission network grid

Average Salary: \$51,000/year

Min. Educational Req.: HS Diploma/GED

Recommended Coursework: Computer Programming, Electronics

Experience Needed: High Level
3-4 years of a training program, typically in-house

Employer Type: Government, Power Plants/Facilities

Related Careers:

1. Hydro-Electric Plant Operator

Power System Operator & Instructor

Description: Operate power distribution systems; design, review, evaluate and conduct training for control room personnel

Average Salary: \$51,000/year

Min. Educational Req.: HS Diploma/GED

Certification: NERC Reliability Authority or System Operator Certification

Experience Needed: High Level
10 years of progressively responsible work experience with 5 years in control room operations and 3 years as a Senior Shift Power System Operator

Employer Type: Government, Power Plants/Facilities

Energy Infrastructure Engineer

Description: Specialize in Transit/Rail, Highways and Bridges, Mine, Airports, and Energy Infrastructure Engineering

Average Salary: \$77,000/year

Min. Educational Req.: Bachelor's degree in Mechanical Engineering

Recommended College Coursework: Mechanical and Electrical Engineering, Infrastructure development

Certification: Certified Energy Manager (CEM), Professional Engineer License (PE)

Experience Needed: High Level
4-10 years of experience in energy management/engineering

Employer Type: Private Firms, Government

Related Careers:

1. Mechanical Engineer

Smart Grid Engineer

Description: Address complex problems in the electric power delivery infrastructure related to grid modernization

Average Salary: \$91,000/year

Min. Educational Req.: Advanced level of capability either through education, PhD/Master's, or equivalent experience

Recommended College Coursework: Electrical Engineering, Systems Control, Computer Science and Information Technology

Experience Needed: High Level
Journey level status plus 2 – 5 years of related experience dealing with the technical aspects of power grids

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Electrical Engineer
2. Power Grids Planner

Biogas and Biomethane

Biogas and biomethane projects capture emissions from wastewater treatment facilities, animal manure, and landfills and convert these harmful emissions into valuable natural gas resources. In 2007, the National Renewable Energy Laboratory reported that there are 6 megawatts of capacity from wastewater plants and 14 megawatts from landfill gas in Colorado, enough to power approximately 15,000 households.³⁶ Further development of biogas and biomethane resources will create a variety of employment opportunities in communities across Colorado.³⁷

Biomass Collection, Separation & Sorting

Description: Collect, haul, sort and process biomass waste for distribution to biomass facilities

Average Salary: \$21,000/year

Min. Educational Req.: High School, GED

Recommended Coursework: Resource/Engineering, Computer Programming

Experience Needed: Entry Level

Certification: Commercial Drivers license

Employer Type: Private Firms, Government, Power Plants/Facilities

Biomass Plant Operations, Engineering & Maintenance

Description: Designs, constructs, operates and / or maintains plants that generate electricity from the combustion of biomass

Average Salary: \$69,000/year

Min. Educational Req.: Bachelor's degree or higher in Engineering

Recommended College Coursework: Resource/Engineering, Computer Programming

Experience Needed: High Level

Employer Type: Private Firms, Government, Power Plants/Facilities

Animal Waste Biomethane Gas Collection System Technician

Description: Responsible for operations, maintenance and repair of biomethane equipment at animal waste operations

Average Salary: \$41,000/year

Min. Educational Req.: Trade School, Apprenticeship, or Associate's Degree

Recommended College Coursework: Power Generation Operation, Landfill Gas Plant Operations, Chemistry

Experience Needed: Mid-Level
Minimum 3 years of equipment operations experience using mechanical, electrical, instrument or control system skills

Employer Type: Agriculture, Consultants, Utilities

Landfill Gas Technician

Description: Responsible for assisting head landfill operator in daily operations, maintenance and repair and performing landfill gas leak checks on recurring basis

Average Salary: \$23,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level

Employer Type: Landfill Facilities, Consultants

Related Careers:

1. Landfill gas collection system operator

Employer Example: Microgy, Weld County, CO

Microgy is a developer, owner, and operator of renewable gas facilities. Using anaerobic digestion technology, Microgy extracts methane-rich biogas from animal and food industry wastes. Xcel Energy, Colorado's largest power utility, recently announced plans to work with Microgy to use animal waste and food processing residuals to make renewable natural gas for Xcel Energy's Fort St. Vrain Generating Station near Platteville.³⁸ Construction is scheduled to begin in the first half of 2010, and when complete the plant is expected to employ eight to twelve people.³⁹ Microgy is also looking to open more methane plants in Colorado in the future.⁴⁰ Jobs at the planned Weld County facility may include construction, finance, or ongoing operations and maintenance of the anaerobic digester installations.⁴¹

Landfill Gas to Energy Plant Installation, Operations, Engineering and Management

Description: Design, construct, operate and / or maintain system that delivers landfill gas to energy facilities to produce useable fuel

Average Salary: \$69,000/year

Min. Educational Req.: Bachelor's degree or higher in Engineering

Recommended College Coursework: Resource/ Petroleum Engineering, Computer Programming

Certification: Dependent on position sought

Experience Needed: High Level

Employer Type: Private Firm, Government, Power Plants/Facilities

Landfill Gas Collection System Operator

Description: Responsible for daily operations, maintenance and repair and extracting landfill gas in a proper, safe, reliable and efficient manner

Average Salary: \$41,000/year

Min. Educational Req.: Trade School, Apprenticeship or Associate's Degree

Recommended Coursework: Power Generation Operation, Landfill Gas Plant Operations, Chemistry

Experience Needed: Mid-Level
Minimum 3 years of equipment operations experience using mechanical, electrical, instrument or control system skills

Employer Type: Landfill Facilities, Consultants

Related Careers:
1. Landfill gas collection system technician

Geothermal Energy

The heat of the Earth is increasingly being harnessed to provide heat and electricity. In Colorado, ground source heat pumps are already being used to tap below ground temperatures for heating.⁴² While Colorado currently has no geothermal projects that generate electricity, the 2008 action plan of the 'GeoPowering the West' Colorado State Working Group includes the goal of developing Colorado's first geothermal electricity production facility.⁴³ Developing Colorado's geothermal resources will help create new jobs and boost the economy of rural communities.⁴⁴

Geothermal Sheet Metal Worker

Description: Perform all operations necessary to make, install, and repair geothermal power generators

Average Salary: \$33,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended College Coursework: Math, Mechanical Drawing, Metal shop, Welding, Heating and Air-Conditioning

Experience Needed: Entry to Mid-Level
Journey level status

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:
1. Machinist
2. Welder

Geothermal Heat Pump Machinist

Description: Make precision metal or plastic parts for geothermal heat pumps; use computer numerically controlled machine tools; set up and operate all of the basic machine tools and many specialized variations

Average Salary: \$31,000/year

Min. Educational Req.: Apprenticeship or Trade School

Recommended College Coursework: Metalworking, Drafting, Math, and Computer courses

Experience Needed: Entry to Mid-Level
Journey level status

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:
1. Welder
2. Sheet Metal Worker

Hydrogeologist

Description: Perform groundwater monitoring; collect water level measurements and water quality samples from production wells and monitoring wells

Average Salary: \$63,000/year

Min. Educational Req.: B.S. Degree in the field of geology, hydrogeology, earth science, or related field

Recommended College Coursework: Hydrogeology, Earth Sciences

Experience Needed: Entry-Level
Some experience in groundwater sampling activities and hydrogeologic data presentation is a plus

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Water Purification Systems Service Technician

Geothermal Power Plant Structural Engineer

Description: Design the geothermal power generating structure

Average Salary: \$67,000/year

Min. Educational Req.: Bachelor's Degree in Civil Engineering

Recommended College Coursework: Structural Engineering, Mechanical Systems, Geothermal

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
5 - 15 years of facility and industrial system design with 5 years of power plant design

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Civil Engineer

Geothermal Plant Installation Technician

Description: Install geothermal projects

Average Salary: \$46,000/year

Min. Educational Req.: HS Diploma/GED

Experience Needed: Entry Level
Experience in construction, refrigeration, electrical and/or plumbing installations

Employer Type: Private Firms, Power Plants/Facilities

Related Careers:

1. Systems Service Technician

Geothermal Engineer

Description: Responsible for design, development and testing of all aspects of components, equipment and machinery

Average Salary: \$87,000/year

Min. Educational Req.: Bachelor's Degree in Mechanical Engineering

Recommended College Coursework: Mechanical Engineering, Electrical Engineering, Earth Sciences, Geothermal production

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
5 years with similar responsibilities

Employer Type: Private Firms, Government, Power Plants/Facilities

Related Careers:

1. Energy Engineer

Geothermal Operations Engineer

Description: Collect and process information on well-field and plant performance, diagnose well problems and design procedures to fix them

Average Salary: \$69,000/year

Min. Educational Req.: Bachelor's degree or higher in Engineering

Recommended College Coursework: Resource/ Petroleum Engineering, Computer Programming,

Certification: Professional Engineer (P.E.)

Experience Needed: High Level
15 years experience in geothermal resource engineering

Employer Type: Private Firms, Government, Power Plants/Facilities

Geothermal Plant Efficiency Operator

Description: Responsible for maintaining and monitoring plant equipment for efficient and safe plant operations and planning and handling all hazardous materials and wastes in a safe and environmentally sensitive manner

Average Salary: \$52,000/year

Min. Educational Req.: HS Diploma/GED

Certification: HAZMAT certification

Experience Needed: High Level
Minimum 5 years of power plant operating experience

Employer Type: Government, Power Plants/Facilities

Related Careers:

1. Weatherization Operations Manager

Endnotes

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<http://www.colorado.gov/energy/images/uploads/pdfs/23158d65cf0c2de7be220e35d1f7b72a.pdf>.

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¹⁹ Hexcel Corporation press release, Groundbreaking Celebration at Hexcel's New Wind Energy Prepreg Facility in Windsor, Colorado (Feb. 19, 2009), available at

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