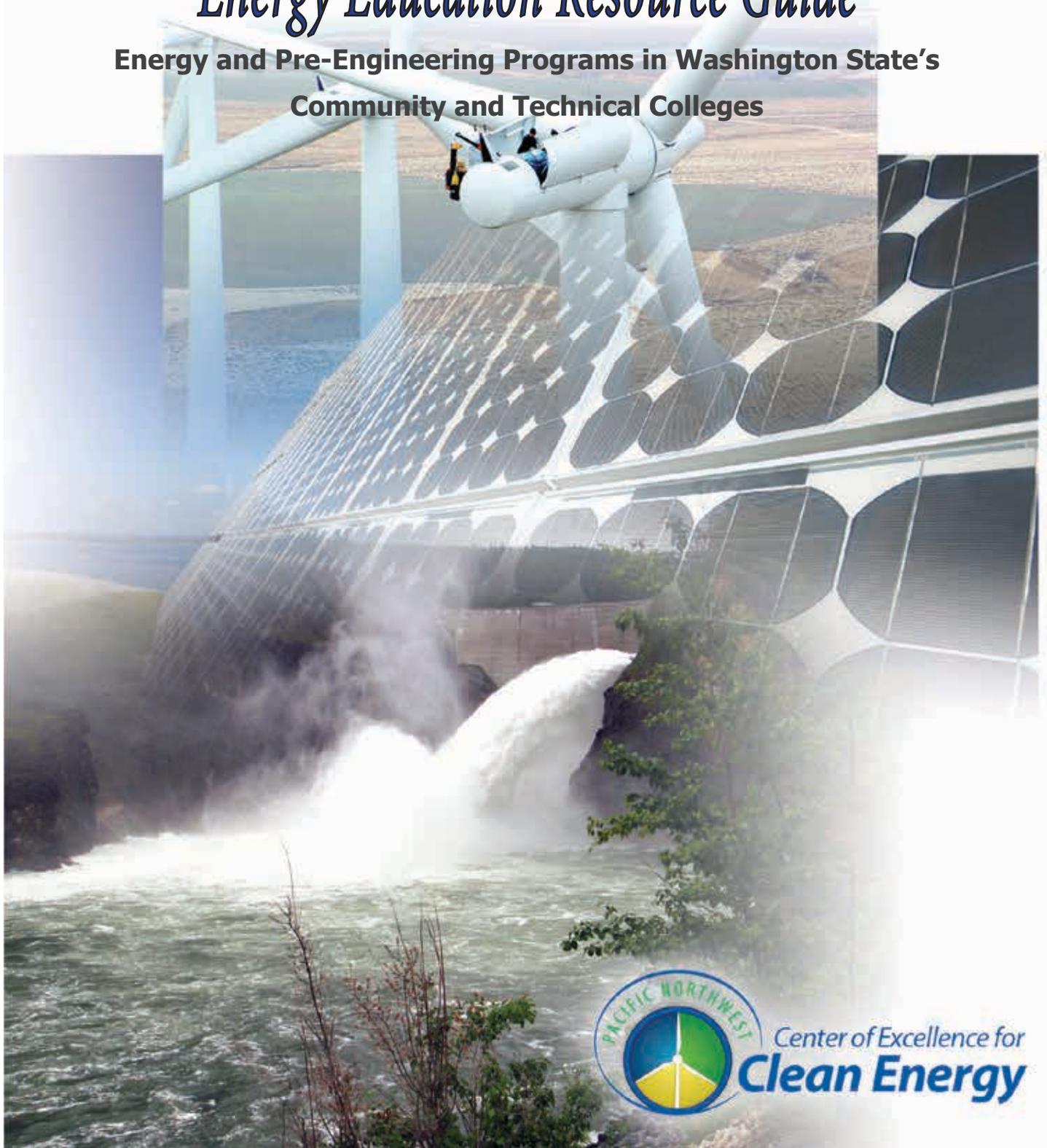


# Pacific Northwest Center of Excellence for Clean Energy "A Centralia College Partnership"

## *Energy Education Resource Guide*

Energy and Pre-Engineering Programs in Washington State's  
Community and Technical Colleges





Eleven Centers of Excellence across Washington State represent a sector strategy that serves as an economic development driver for industries and helps the state's economy grow. Each Center focuses on a targeted industry and is built upon a reputation for fast, flexible, quality education and training programs for Washington State Community and Technical Colleges (CTCs).

Centers serve as a point-of-contact and resource hub for industry trends, best practices, innovative curriculum, and professional development opportunities. The Centers also maximize resources by bringing together workforce education and industry partners in order to develop highly-skilled employees for targeted industries.

### What do Centers of Excellence do?

- Maintain an institutional reputation for innovation and responsive education and training delivery to their targeted industry.
- Act as a broker of information and resources related to their targeted industry for industry representatives, community-based organizations, economic development organizations, community and technical colleges, secondary education institutions, and four-year colleges and universities.
- Translate industry research into best practices.
- Provide system coordination, coaching, and mentoring to assist in building seamless educational and work-related systems.
- Build a competitive workforce for driver industries in Washington State.

### Who/Where are we?

Aerospace and Advanced Materials Manufacturing at Everett Community College - [www.coeaerospace.com](http://www.coeaerospace.com)  
 Agriculture at Walla Walla Community College - [www.agcenterofexcellence.com](http://www.agcenterofexcellence.com)  
 Allied Health at Yakima Valley Community College - [www2.yvcc.edu/coe/default.html](http://www2.yvcc.edu/coe/default.html)  
 Careers in Education at Green River Community College - [www.careersined.org](http://www.careersined.org)  
 Pacific Northwest Center of Excellence for Clean Energy at Centralia College - [www.cleanenergyexcellence.org](http://www.cleanenergyexcellence.org)  
 Construction at Renton Technical College - [www.constructioncenterofexcellence.com](http://www.constructioncenterofexcellence.com)  
 Global Trade & Supply Chain Management at Highline Community College - [www.coeglobaltrade.com](http://www.coeglobaltrade.com)  
 Homeland Security Emergency Management at Pierce College - [www.coehsem.com](http://www.coehsem.com)  
 Information & Computing Technology at Bellevue College - [www.coeforict.org](http://www.coeforict.org)  
 NW Center of Excellence for Marine Manufacturing & Technology - [www.marinecenterofexcellence.com](http://www.marinecenterofexcellence.com)  
 Center of Excellence for Unmanned & Autonomous Systems - [www.coeuas.com](http://www.coeuas.com)

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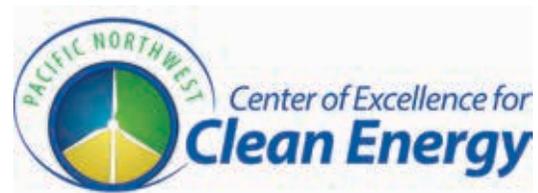
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[www.cleanenergyexcellence.org/collegeprograms](http://www.cleanenergyexcellence.org/collegeprograms)

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**The Pacific Northwest Center of Excellence for Clean Energy** is a nationally recognized model providing strategic coordination for the energy industry's skilled workforce in the Pacific Northwest. The Center is led by a broad based consortium comprised of industry and labor leaders that guide the center to:

- Develop and mature industry and labor partnerships to better understand the ever changing workforce issues facing electric utilities and independent power producers.
- Translate energy industry research into "Best Practices" training and education to ensure programs meet industry's workforce needs.
- Provide clear education and career pathways for students and job seekers for entry into high skills high wage energy jobs.
- Create a competitive workforce pipeline to meet increasing energy demands and support the economic future of the Pacific Northwest.

**The Advisory Board** is a permanent standing board to provide advice and insight to the Center of Excellence from the perspective of industry, education, labor, and the community. The board helps the Center achieve its mission by ensuring that programs and projects advance the needs of the energy sector within the region. The diversity of membership provides an invaluable resource to center staff and program partners to easily access information and contacts throughout the industry. The strength of the advisory board was a key component in the elevation of the center from a state organization to a Department of Energy recognized Regional Center of Excellence. The current advisory board members are:

**Troy Nutter (Chair), Puget Sound Energy**

- Avista – Jeremy Gall
- Bonneville Power Administration – P.J. LeCompte
- Centralia City Light – Micah Goo, M.L. Norton
- Chelan PUD – Brian O'Dell
- Clark PUD – Ben Feliz
- United States Army Corps of Engineers – Jay Pickett
- Energy Northwest – Glenn M. Pierce
- Lewis County PUD – Cecile Bamer, Travis Kinney
- Pacific Mountain Workforce Development Council – Rich Mulryan
- Seattle City Light – (vacant)
- Snohomish County PUD/IBEW 77 – Jackie Rae
- Tacoma Power – Alice Massara, Sara Bowles
- Washington State Department of Commerce – Brian Young
- Washington State Labor Council, AFL-CIO – Kairie Pierce



**Educational Partners**

- Centralia College Trustee – Jim Lowery
- Regional Education and Training Center – Bob Topping, Bob Guenther
- Shoreline Community College Clean Energy Program – Louise Petruzzella
- Washington State University Energy Program – Todd Currier, Alan Hardcastle

**Ex-Officio**

- Centralia College – Rulon Crawford and John Steidel
- Center of Excellence for Clean Energy – Barbara Hins-Turner, Executive Director

# Director's Corner

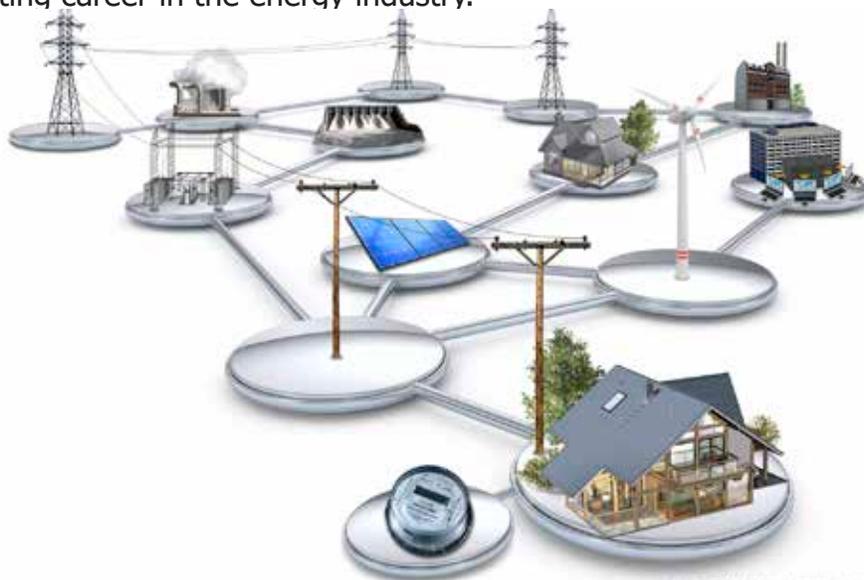
~Barbara Hins-Turner, Executive Director, Pacific Northwest Center of Excellence for Clean Energy "A Centralia College Partnership"

Power Up Your Future

There is amazing work happening in the Community and Technical College (CTC) system across Washington state and the Pacific Northwest region to develop a skilled energy industry workforce. As the energy industry faces massive retirements and technology enhancements are requiring a more "tech savvy" workforce, the industry is reaching out to the CTC system to support their workforce needs.

Within these pages, you will find a vast array of programs that are preparing students to build and sustain our energy future. These programs have been "niched up" across the state to focus on solar and wind energy, sustainability, energy management, power generation and more.

Students graduating from these programs are finding living wage jobs wages ranging from \$15-\$25 per hour with companies such as Avista, Tacoma Power, Puget Sound Energy, Energy Northwest, BPA, and Public Utility Districts across the state. We invite you to contact these colleges to learn more about an exciting career in the energy industry.



Courtesy of Moho Power Company © 2012

[www.cleanenergyexcellence.org/careers/](http://www.cleanenergyexcellence.org/careers/)

## Education Resource Guide

This guide is designed to ensure you start your journey to a career in energy with all the information you need to successfully arrive at your goal. It is critical to any educational success that the college, degree, and certificate are the right fit.

**Bachelor of Applied Science (BAS)** is designed to build on associate degrees that provide workplace skills and provide a path to the baccalaureate level without requiring the student to earn another two-year degree.

**Associate in Applied Science-Transfer (AAS-T)** is designed for students who plan to transfer to a 4-year institution with an applied science degree in a professional/technical program.

**Associate in Applied Science (AAS)** is awarded to students completing an approved course of study in a professional technical program

**Certificate of Achievement** is designed for students who wish to take specialized courses in a particular field and desire certification acknowledging completion of specific program modules.

**Certificate of Accomplishment** is designed to provide recognition of completion of certain approved courses or small modules of courses offered through a particular technical program.

## Electrical Construction, Electrical & Facility Maintenance Engineering

**Electrical Construction** - This program is available for students seeking to earn a degree or certificate in electrical construction for jobs in commercial and residential construction, public utility agencies, and industrial construction and maintenance. The program also provides extended learning opportunities for persons previously or currently employed in these and related occupations. Students interested in receiving an ELO1 license should consult with career advisors to ensure enrollment in the appropriate program.



**Career options:** Prepares students to apply to the Southwest Washington Electrical Joint Apprenticeship Training Committee, an organization affiliated with the International Brotherhood of Electrical Workers Local #76. Upon completion of the 3,000 hours of instruction, students will be given 4,000 hours that apply toward the EL01 license.

**Degree offered:** Associate of Applied Science: Electrical Construction (120-158 credits)

**Certificate offered:** Certificate of Competency: Residential Electrician (71 credits)

**Electrical Engineering Technician** - Bates offers the only program in the region where students prepare for careers in electrical code application, interior and exterior lighting design, and all aspects of electrical design. Instruction includes all phases of electrical engineering, CAD drafting, and design for commercial buildings. Technician's design and draft electrical power, signal, interior, and exterior lighting systems. They also assist in specification writing and share in on-site construction supervision.



**Careers options:** Design and draft electrical power, signal, interior and exterior lighting systems.

**Degree offered:** Associate of Applied Science: Electrical Engineering Technician (113-123 credits)

**Exam offered:** National Institute for Certification in Engineering Technologies (NICET)

**Facilities Maintenance Engineer** - Students prepare for careers in the building care and maintenance industry, including boiler operator, building repairer, facilities maintenance engineer and custodian in industrial and office buildings, hotels, schools, and government agencies. Instruction includes electricity, welding, blueprint reading, machine maintenance, grounds keeping, boiler repair and operation, HVAC/R, and advanced industry applications. Major elements of the program prepare students for Class V and Class IV boiler operator/fireman certification. This is a pre-apprenticeship program for the Western Washington Operating Engineers Facilities Custodial Services Apprenticeship Committee and the Western Washington Stationary Engineers Apprenticeship Committee. The program also provides extended learning opportunities for persons previously or currently employed in these or other related professions.

**Careers options:** Students prepare for careers in the building care and maintenance industry.

**Degree:** Associate of Applied Science: Facilities Maintenance Engineer (120 credits)

**Certificates:** Cert. of Competency: Facilities Maintenance Engineer (84-87 credits); Cert. of Training: Building Care and Maintenance I (18 credits); Building Care and Maintenance II (17 credits); Maintenance Technician I (18 credits); Maintenance Technician II (17 credits)



## Clean Energy Technology, Electrician, Instrumentation & Control

**Clean Energy Technology** - Students will be able to: describe and evaluate the impact of renewable energy within the context of sustainability, economics, policy, and society; describe and apply a working knowledge of energy resources and their technological systems; and apply ethical and professional practice within the field of renewable energy and engineering technology. The degree will be geared towards providing students with a strong foundation in electronics, engineering fundamentals, and sustainable energy technology, and will be designed so that graduating students will have the option of going directly to industry or transferring to the Institute for Energy Studies program at Western Washington University.

**Careers options:** Including but not limited to: Engineering Technician, Electronics Technician, Electronics Engineering Technician, Solar Installer, Wind Energy Technician, Wind Turbine Service Technician.

**Degree offered:** Associate of Applied Science – Transfer (AAS-T) Engineering Technology: Clean Energy (95 credits)

**Certificates offered:** Clean Energy Technology Certificate (13 credits)

**Electrician** - Students become registered “electrician trainees” with the State of Washington Department of Labor and Industries and are awarded work experience hours upon completion. Occupational choices are extensive in the field; many graduates work in the construction industry, while others work in manufacturing or maintenance. In BTC’s Electrician program, you’ll learn how to install, maintain, and repair residential, commercial, industrial and renewable electrical systems. You will also learn how to read blueprints and schematics, bend and install conduits, program VFDs and PLCs, and troubleshoot circuits.

**Careers options:** Most graduates work as electricians. In the United States, more than half of all electricians are employed in the construction industry. Others work as maintenance electricians in virtually every industry including electrical equipment distributors, communications companies, electrical utility companies and industrial manufacturing plants. Potential positions include apprentice electrician, journeyman electrician, electrical contractor, electrical equipment technician, maintenance electrician, television cable technician, utility company technician, telephone technician and electrical equipment salesperson. Nationally, one out of every 10 electricians is self-employed.

**Degree offered:** Associate of Applied Science: Electrician (108 credits)

**Certificates offered:** Electrical Construction (64 credits)

**Instrumentation & Control Technology** - Prepares students to maintain, repair, and troubleshoot instrumentation and control systems. A combination of theory and hands-on training offers a variety of modern process measurement and control instrumentation with actual working processes and computer simulations which duplicate conditions that technicians experience. Approximately half of the instructional time is laboratory experience to develop knowledge and skills with electronic circuits, test equipment, individual instruments, multiple instrument control systems, and practical computer applications.

**Careers Options:** Most graduates work as instrumentation and process control technicians in bio-pharmaceutical manufacturing facilities, oil refineries, food processing, pulp/paper mills, power plants, metal smelters, systems integrators, research and development, or water/sewage treatment facilities.

**Degree offered:** Associate in Applied Science: Instrumentation & Control Technology (132 credits)

Associate in Applied Science - Transfer: Instrumentation & Control Technology (123 credits)

## Industrial Electrical Technology

**Industrial Electrical Technology** - The Industrial Systems Technology - Industrial Electrical Technology program provides a comprehensive two-year curriculum designed to prepare students for career opportunities as industrial electrical technicians. Students receive instruction in safety, electrical and electronic theory, process control, instrumentation, and Programmable Logic Controllers.

Today's industrial electrician is a multi-faceted technician. Electrical and control system technologies are increasingly sophisticated and complex. The Industrial Electrical Technology program reflects the changing trends in the industrial climate while maintaining a broad-based curriculum blending theory and practical applications.



Arlen Everist, Seattle City Light  
Meter Electrician

Related instruction includes mathematics, technical drawing interpretation, computer applications, communications, preventive maintenance, safety, and first aid. This program is intended for individuals who are seeking entry level employment opportunities and those updating their skills.



Working in the lab at Big Bend  
Community College.  
Photo courtesy of Festo

**Career Options:** Industrial Electrical program provides a comprehensive two-year curriculum designed to prepare students for career opportunities as industrial electrical technicians.

**Degree offered:** Associate in Applied Science: Industrial Electrical Technology (105 credits)

**Certificates offered (9):**

- Certificate of Accomplishment: Basic Electricity (15 credits)
- Certificate of Accomplishment: Electronics (15 credits)
- Certificate of Accomplishment: Industrial Electricity (20 credits)
- Certificate of Accomplishment: Instrumentation (15 credits)
- Certificate of Accomplishment: National Electric Code (20 credits)
- Certificate of Accomplishment: Programmable Logic Controllers (15 credits)
- Certificate of Achievement: Electronics Technology (46 credits)
- Certificate of Achievement: Industrial Electrical (48 credits)
- Certificate of Achievement: Programmable Logic Controllers (48 credits)

## Environmental Technologies and Sustainable Practices

**Bachelor of Applied Science in Sustainable Practices** - This program is designed for students who have completed a two-year degree in a related subject or who meet the distribution requirements through prior college coursework. Students work closely with faculty and a dedicated advisor to complete 90 credits of upper division coursework such as "Social Perspectives on Sustainable Practices" and "Earth Systems and Global Climate Change".

**Career Options:** Graduates are prepared for technical and management positions in the sustainability field and to pursue advanced degrees and certifications.

**Degree offered:** Bachelor of Applied Science in Sustainable Practices (90 credits)

**Environmental Technologies and Sustainable Practices** - The Associate in Applied Science - Transfer degree in Environmental Technologies and Sustainable Practices is a comprehensive technical degree that provides industry-specific knowledge and professional skills that are vital to staking a claim in the emerging green economy. Governments and businesses in this state and around the world are looking for professionals who can "pioneer innovative pathways" as we rethink and redesign how we consume resources; students in this program have the chance to be a part of that as professional practitioners, as well as in roles as informed consumers and political citizens. Graduates learn the skills necessary to plan and implement sustainable approaches to how we live and work by managing complex projects for government agencies, private and non-profit organizations, water, energy, and agriculture industries, construction management firms, and educational institutions.

**Career options:** A degree in Environmental Technologies and Sustainable Practices helps students prepare for the following industry positions: carbon footprint analyst, energy efficiency specialist, energy resource manager, greenhouse gas emissions specialist, lifecycle analysis technician, sustainability coordinator, sustainability trainer, sustainability systems analyst, engineering technician, natural resource analyst, energy manager, water plant operator, recycling coordinator, water conservation director, energy auditor, air quality manager, environmental analyst, community garden coordinator, and many more.

**Degree offered:** Associate of Applied Science-Transfer - Environmental Technologies and Sustainable Practices (92-93 credits)

**Certificates offered (3):**

- Community Energy Systems Specialist (55-60 credits)
- Energy Audit Specialist (32 credits)
- Energy Management Specialist (64-68 credits)



Cascadia College's Global Learning and the Arts building has earned a Leadership in Energy and Environmental Design (LEED) Platinum award.

## Energy Technology - Power Operations

**Energy Technology - Power Operations** - The Energy Technology/Power Operations AAS program at Centralia College prepares students to compete for entry-level positions such as power plant operator, substation operator, technician, and other high voltage pre-apprentice and apprenticeship positions within the energy industry. Upon successful completion of the program students are able to:

- Describe the basic concepts of electron flow, magnetism, and Ohm's Law
- Describe how electricity is generated, transmitted, and distributed
- Successfully take the entrance-exams for entry level jobs and apprenticeships

This program includes Washington State's first and only Hydro-Power class. This course introduces students to basic concepts in hydro-electric dams, including: dam types; turbine designs; generators and transformers; power system operations such as: SCADA, NEC, WAC, NESC, NFPA; governing regulations (FERC, NEPA, ESA); and water quality concerns.

Program advisors include industry and organized labor leaders from Avista, Bonneville Power Administration, Centralia City Light, IBEW 77, Lewis County PUD, Puget Sound Energy, Seattle City Light, Tacoma Power and The Washington State Labor Council. The program is also broadcast through interactive (ITV) virtual classrooms in Spokane Community College - Ione Campus.

Centralia College also offers the North American Electric Reliability Corporation (NERC) System Operator certification preparatory class, which provides students a foundation to help them prepare for NERC's system operator certification exam. It also prepares operators to handle the bulk power system during normal and emergency operations. These industry-accepted qualifications are set through internationally recognized processes and procedures for agencies that certify persons.

**Career options:** The program prepares students for entry level positions such as power plant assistant control operator, technician, and other high voltage apprenticeships.

**Degree offered:** Associate of Applied Science: Energy Technology – Power Operations (100-110 credits)



Centralia College Energy Program students tour Tacoma Power's Mayfield Dam

## Construction Technology (Energy Management)

**Construction Technology** - This program is designed to train construction professionals and facilities managers for building applications and systems that consume a minimal amount of non-renewable resources and contribute to environmental and personal health. Construction Technology students get hands-on experience with residential construction, with the opportunity to build a tiny house from start to finish. This gives them the opportunity to see what they can do and know that they can do it. With the Construction Technology program, students will also learn to complete a Leed Energy Auditor Home Inspection. The program includes an overview of sustainable green building models with a focus on energy, indoor health, and natural resources, and also introduces solar energy, water energy, air energy, and geothermal energy. If you love building things and want to learn more about how sustainable building methods and the use of natural energy resources, this is the program for you.

This program will prepare graduates for careers in energy management, indoor air quality, solar installation, home energy rating systems, and other specialties that support the design, building, and maintenance of sustainable living environments. Participants will receive a solid foundation in applied mathematics, applied physics, and communication. Students will also receive training in industry-specific applications using energy-efficiency technology to diagnose building deficiencies.

**Careers options:** Advanced training in sustainable systems, solar (photovoltaic) systems, resource conservation management, and weatherization will prepare graduates for a variety of careers within the construction and utilities industries, including careers as resource conservation managers, energy auditors, weatherization specialists, solar energy specialists, and home energy raters.

**Degree offered:** Associate in Applied Technology: Construction Technology (112 credits)

Associate in Applied Technology - Transfer: Construction Technology (117 credits)

**Certificate offered:** Construction Technology Certificate (37 credits)



## Nuclear Technology

**Nuclear Technology** - Columbia Basin College (CBC) works closely with the nuclear industry, both locally and nationally. As one of 25 Nuclear Uniform Curriculum Programs (NUCP) in the U.S., CBC and Energy Northwest partner to assure that the CBC Nuclear Technology program is aligned with the needs of the nuclear power industry and are consistent with the established standards for accredited utility training programs so that all graduates have the same basic knowledge necessary to be successful power plant workers.

Program development has been guided by 15 members of a program planning committee representing organizations such as AREVA, CHPRC – CH2MHill Plateau Remediation Company, Central Washington Building and Construction Trades Council, Energy Northwest, HAMMER, IBEW Local 77, Dade Moeller/NV5, TFE -Technical and Field Engineering, Inc., Washington River Protection Solutions, and Pacific Northwest National Laboratory. These organizations have also provided a variety of scholarship, internship, hands-on learning, and employment opportunities to CBC Nuclear Technology students.



Working in the lab at Columbia Basin College

The Nuclear Technology program is nationally accredited by the Institute of Nuclear Training Operations (INPO). Through this accreditation, graduates may earn the National Academy for Nuclear Training (NANT) certificate--a certification that affirms a graduate's skills and knowledge for the respective ACAD 08-006 curriculum and training position for two years after the issue date.

**Career options:** Graduates of the program can work within the nuclear industry in areas such as nuclear power plant operating and processing facilities, disposal of nuclear waste, laboratories, and other nuclear applications. Operators and Instrumentation and Control Technicians have transferable skills that allow them to also work in industries such as: energy generation (wind, hydro, gas, and oil), process operations, and manufacturing.

**Degrees offered:** One-year certificates and two-year Associate of Applied Science (AAS) Degrees in Nuclear Technology in three options:

- Instrumentation and Control Technician (110-112 credits)
- Non-licensed Nuclear Operator (operations) (104-106 credits)
- Radiation Protection Technician (100-102 credits)

**Certificate offered:** National Academy for Nuclear Training Certificate, DOE Radiological Control Technician CORE, 40-hour HAZWOPER, RP Fundamentals/NUF, Plant Access, Radiation Worker, Power Plant Operator Selection System (POSS), and Power Plant Maintenance Selection System (MASS)

## Technical Customer Service Representative

**Technical Customer Service Representative** - This program teaches students how to troubleshoot incoming customer questions, maintain accurate electronic records, and provide excellent leadership and customer service. Coursework covers topics in typing, supervision, marketing, business communications, and business protocols. The program features hands-on labs which provide students with practical experience.

The Technical Customer Service Representative Certificate is part of the Business, Marketing, and Entrepreneurship department, which offers an Associate of Applied Arts (AAA) in Management, a Bachelor of Applied Science (BAS) in Marketing and Entrepreneurship, and a Bachelor of Applied Science (BAS) in Applied Management.



This program was created as part of the WISE grant funded by a Department of Labor TAAACCT grant, using skill standards that were funded by the Pacific Northwest Center of Excellence for Clean Energy under a Department of Energy grant.

**Career Options:** Employment opportunities occur in businesses of all types and sizes. Washington State currently has 2,600 open positions for customer service professionals in a call center environment, many offering full-time positions with benefits.

**Certificate Offered:** Certificate of Proficiency Technical Customer Service Representative (45 Credits)

*"Advancements in modern technology and mobile communications are now enabling utilities to provide greater choice and deliver safe, dependable service to customers. As utility consumers apply new technologies to better manage their energy use, successful utility Customer Care organizations will play a vital role in transforming the customer experience from business-as-usual to integrating new tools, and providing education and expertise across the industry."*

Aundrea Jackson  
CIS Project Manager  
Customer Access Center Manager  
Puget Sound Energy



Photos courtesy of Puget Sound Energy



## Industrial Power and Control

**Industrial Power and Control** - The Industrial Power and Control Program at North Seattle College prepares students for immediate employment and future advancement in companies or government organizations that manufacture, service, sell, design, or support electrical and electronic systems that control machinery, automation, and/or processes.

Course content emphasizes the control of large electrical currents and large electromechanical systems through solid state, digital, and microprocessor devices. The program provides in-depth study of industrial controls, fluid power, AC and DC rotating equipment, instrumentation and measurement, and system control principles. The Industrial Power lab is equipped with programmable logic controllers, variable speed drives, and three-phase induction motors. \$400,000 in new equipment related to the power area (motor controls, electronic control of motors) is becoming available for use because of the new Eastern Washington University/NSC BSEE program.



Upon completion of the degree, students are able to:

- Identify and apply technical concepts and terms used in industrial energy and control.
- Analyze and troubleshoot industrial energy generation, conversion and control systems.
- Use electronic circuit simulation software for circuit design and analysis.
- Repair, maintain and install electronic and electrical control systems.

**Career options:** Industrial Machinery Mechanic, Industrial Electrician, Electrical and Electronics Repairers of Commercial and Industrial Equipment

**Degree offered:** Associate of Applied Science: Industrial Power and Control (111 credits)

**Certificate offered:** Sustainable & Conventional Energy & Control Technology (SCEC) (71-73 credits)





## Entrepreneurship

**Entrepreneurship** - The Energy and Innovation Entrepreneurship Certificate program prepares students for new venture planning, entrepreneurial start-up, social media marketing, and entrepreneurial finance. The program teaches students how to build a successful entrepreneurial venture from the ground up including analysis of an entrepreneurial mind set, market assessment, how to write a business plan, and innovative social media marketing strategies. This program is designed to allow students in Energy Technology and other innovation programs the opportunity to gain the knowledge and understanding of entrepreneurship. The program encourages students to develop a roadmap to successful entrepreneurship and business ventures.

This program introduces future entrepreneurs to key opportunities in the energy and innovation marketplace. It also includes an overview of energy revenue streams, concepts of supply and demand, pricing and marketing, federal regulatory and localized rate case impacts, and the changing role of customers in the energy economy.

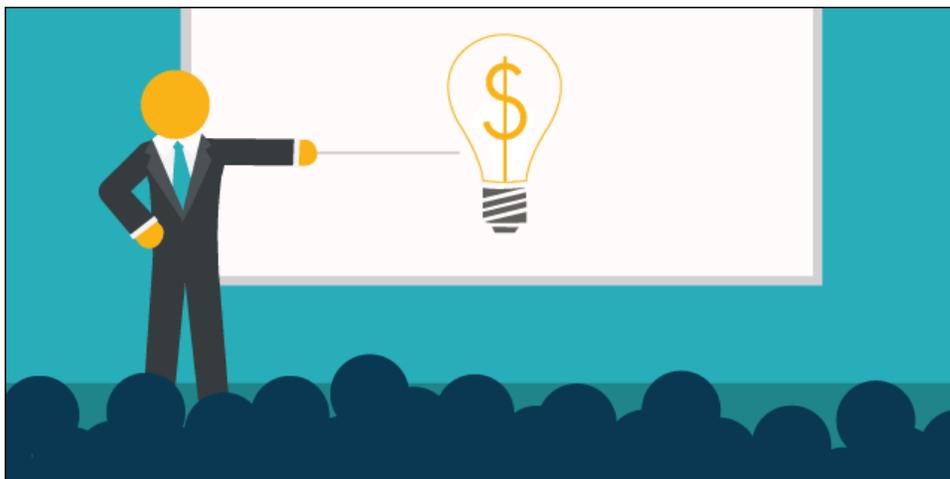
### Learning Outcomes:

- Write and present a business plan
- Identify business start-up funding sources
- Demonstrate an entrepreneurial mind-set and the skills required to be a successful entrepreneur
- Analyze market trends and innovation for new opportunities
- Work in teams to cultivate ideas into a working plan for an entrepreneurial venture
- Apply critical thinking skills to entrepreneurial and new venture processes
- Develop and market a business presence and webpage on the Internet

This program was created in collaboration with the Pacific Northwest Center of Excellence for Clean Energy and Grays Harbor College.

**Career Options:** Recent economic trends indicate a major increase in small business start-ups. Many successful entrepreneurs become employers. This program allows students to either start a small business or understand how to market an idea from start to finish. Small business owners perform a variety of tasks including business planning, sales, accounting, finance, and social media marketing.

**Certificate Offered:** Entrepreneurship (24 Credits)



## Clean Energy Technology and Entrepreneurship

**Clean Energy Technology** - The Clean Energy Technology and Entrepreneurship program prepares graduates with the theoretical and practical knowledge necessary for careers in firms that manage, design, build, market, or operate clean energy technologies in the built environment. The program focuses on clean energy technologies and practices that can achieve or approach "Net Zero Energy" in buildings.

The Clean Energy Technology Associate in Applied Arts and Sciences degree is designed to provide students with the theoretical and practical knowledge and skills necessary for a career in sustainable design, construction, maintenance and management. Upon completion of the degree, students are prepared to take the Photovoltaic Entry Level Exam through the North American Board of Certified Energy Practitioners (NABCEP).

Graduates have an understanding of alternative energy, high performance, and zero energy building practices including alternative energy systems, green building techniques, and designing and installing residential and commercial electric, metering and control systems. Emphasis is on residential and commercial buildings with specialties in passive solar, sustainable (green) building Design, photovoltaic (solar electric) systems.



Residential solar in Thurston County.

**Career options:** Graduates can work as a utility conservationist, solar certification specialists, solar customer service professional, entry level energy consultant, green building project specialist, inventory control specialist-solar, solar-process data miner, renewable energy educational liaison, solar PV system designer, solar sales consultant, solar technical support, construction trainee, or energy auditor.

**Degree offered:** Associate of Applied Arts and Sciences: Clean Energy Technology (90 credits)

**Certificate offered:** Certificate of Proficiency: Clean Energy Technology (45 credits)



## Sustainable Building, Engineering Technology

**Bachelor of Applied Science: Sustainable Building Science Technology** - The Bachelor of Applied Science (BAS) in Sustainable Building Science Technology (SBST) program will prepare you to apply expertise and systems knowledge to support highly technical building operations. The SBST degree, which builds on your prior education and work experience, positions you to launch a career where you understand building functions and finance in order to manage structures that are healthier and more durable, efficient, economical, and sustainable.

This program prepares students who have completed an apprenticeship program, a two-year technical degree or approved associate degree and have 2-5 years of related work experience. This unique, 90-credit degree prepares working adult students to apply expertise and systems knowledge to support highly technical building operations, focusing on the complexities of building science, energy codes, building codes, and facility management. Students advance their careers in building functions and finance in order to manage structures that are healthier and more durable, efficient, economical, and sustainable. The degree is taught in a hybrid format, 80% online and 20% in person, with class meetings held at the Seattle Georgetown campus once a month.

**Career Options:** This program offers industry professionals a pathway to becoming a skilled Building Science Professional.

**Degree offered:** Bachelor of Applied Science: Sustainable Building Science Technology (90 credits)



South Seattle College Georgetown Campus



## Electrical Maintenance & Automation, Energy Technology

**Electrical Maintenance & Automation** - Electrical maintenance technicians are responsible for the maintenance, testing, repair, and/or replacement of the electrical systems and controls found in modern industrial plants and large commercial buildings. As the electrical systems become more sophisticated, so must the skills of the electrical maintenance technician. By mixing the theoretical with practical hands-on lab experiences using modern up-to-date industrial equipment and techniques, the student will be prepared for a challenging career in electrical maintenance.

The power systems maintenance degree prepares you to work on electrical substations and with major power systems. The program consists of a combination of classes in electrical maintenance and fluid power technology. It also includes a cooperative work experience. Only students who have received prior approval from the Bonneville Power Administration are eligible for this degree option.

**Career options:** Potential positions include but are not limited to: electrical apprentice, electric service technician, industrial plant electrician technician found in automated manufacturing industries such as wood and paper products, food processing, metals processing, hydro projects, and equipment manufacturing.

**Degrees offered:** Associate of Applied Science: Electrical Maintenance & Automation (121 credits);

Associate of Applied Science: Power Systems Maintenance (121 credits)

**Certificates offered:** Electrical Trainee (64 credits); Electrical Sales (64 credits)

## Ione Campus

**Energy Technology - Power Operations** - The Energy Technology/Power Operations AAS program is broadcast through interactive virtual classrooms at Centralia College. The Energy Technology/Power Operations AAS program at Centralia College prepares students to compete for entry-level positions such as power plant operator, substation operator, technician, and other high voltage pre-apprentice and apprenticeship positions within the energy industry. Upon successful completion of the program students are able to:

- Describe the basic concepts of electron flow, magnetism, and Ohm's Law
- Describe how electricity is generated, transmitted, and distributed
- Successfully take the entrance-exams for entry level jobs and apprenticeships

This program includes Washington State's first and only Hydro-Power class. This course introduces students to basic concepts in hydro-electric dams, including: dam types; turbine designs; generators and transformers; power system operations such as: SCADA, NEC, WAC, NESC, NFPA; governing regulations (FERC, NEPA, ESA); and water quality concerns.

**Career options:** The program prepares students for entry level positions such as power plant assistant control operator, technician, and other high voltage apprenticeships. Jobs in this field include but are not limited to: power generation, transmission, metering, substation operations, plant mechanics, and boiler operations.

**Degree offered:** Associate of Applied Science: Energy Technology – Power Operations (100-110 credits)

# Spokane Community College/Avista Lineworker School

At Avista Jack Stewart Training Center

[www.scc.spokane.edu/TechEd/Avista/home.aspx](http://www.scc.spokane.edu/TechEd/Avista/home.aspx)



## Utility Construction (Gas or Line)

Offered in partnership with Avista Utilities, our four-month utility worker school provides the specialized training needed to work as part of a crew that builds and maintains electrical power lines or gas lines. The program is held at Avista's training facility, where students gain hands-on experience working on the 10-acre line construction site. With this certificate, students will be ready to enter the field as a utility crew helper.

### Gas Construction

Participants learn the skills required of a gas crew helper including how to excavate around buried utilities, install polyethylene gas pipeline, pipeline fittings, locate wire, and residential gas meters and regulators in addition to learning to use the various tools and equipment of the trade through actual field experience. Classroom training covers safety, electrical theory, fundamentals of heating gases that range from Natural gas to Propane, trenching and shoring requirements, locating of underground pipeline, and the importance of attitude and integrity necessary to succeed in today's work environment.

### Line Construction

Participants learn the skills required of a line crew helper including how to set and climb poles, install cross-arms, hardware, lines and transformers in addition to learning to use the various tools and equipment of the trade through actual field experience. Classroom training covers safety, electrical theory, transformers, switching, print reading, and the importance of attitude and teamwork necessary to succeed in today's work environment. The line construction trade requires an extreme physical fitness level, hard work, and commitment both mentally and physically. Students must be able to work under pressure and make quick, sound decisions. The trade sounds fun and looks cool, but it is extremely dangerous. Lineworkers put their lives and the lives of their coworkers on the line every day.

This program assists you in obtaining a Class A CDL, First Aid/CPR card, Flagging Traffic Control card, and Forklift certification. These are NOT required for acceptance into the program.

**Certificates Offered:** Gas Construction (43 credits); Line Construction (43 credits)



Photos courtesy of Avista



Apprentice Lineman at work



## Energy Systems Technology

### Energy Systems Technology (EST)

To complete the AAAS degree in Energy Systems Technology, students first complete a one-year electrical core course sequence with a certificate in Electrical Systems Technology (52.4 Credits), and then specialize in one or more of eight concentrations.

*Note: three of the eight concentrations are not directly related to the energy industry and are not featured in this guide.*

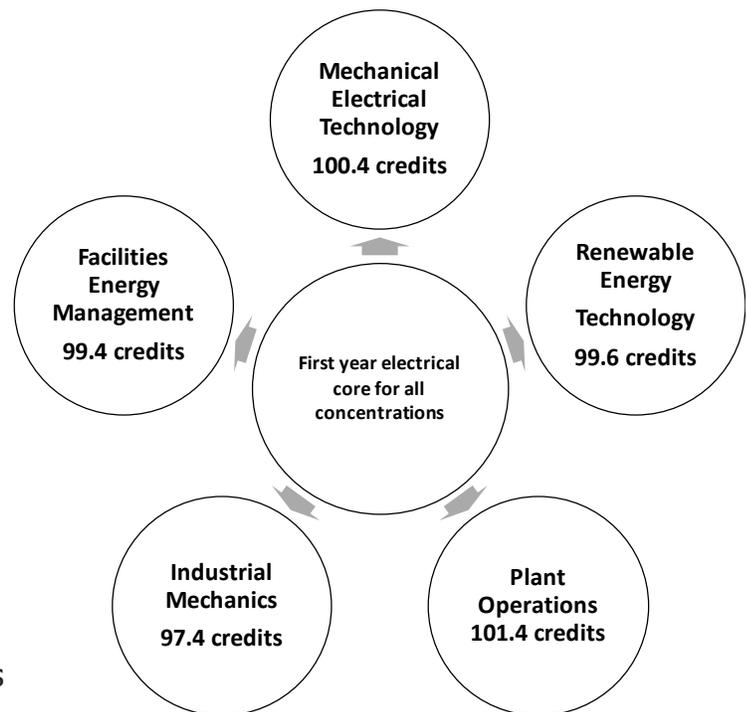


**Mechanical Electrical Technology** - This concentration provides students opportunities to gain the knowledge and skills needed to: read blueprints or technical diagrams; install and inspect wiring, control, and lighting systems, including transformers and circuit breakers; and troubleshoot, diagnose, and repair or replace wiring and equipment safely to NEC standards using a variety of testing devices and power tools.

**Career options:** Mechanical Electrical Technician or Apprentice, Journeyman or Senior Mechanical Electrical Technician, or Mechanical Electrical Technician Supervisor

**Degrees offered:** AAS degree in EST with concentration in Mechanical Electrical Technology (100.4 credits)

**Plant Operations** - This concentration provides students opportunities to gain the knowledge and skills needed to: Calculate, measure, and



Walla Walla students on a field trip at ZeaChem in Boardman, Oregon

process a variety of materials to generate electricity, biofuels, clean water, and high value products; Monitor and control/adjust equipment to ensure optimal performance, including: turbines, pumps, valves, gates, fans, controllers, filters, and instruments; and Troubleshoot, diagnose, and repair or replace wiring and equipment safely to NEC standards using a variety of testing devices and power tools.

**Career options:** Process Technician or Plant Equipment Operator, Lead Systems Operator

**Degrees offered:** AAS degree in EST with concentration in Plant Operations (101.4 credits)



## Energy Systems Technology

**Facilities Energy Management** - Graduates of the Facilities Energy Management concentration will have the knowledge and skills to troubleshoot, repair, and maintain electrical-mechanical equipment, such as: pumps, compressors, motors, valves, gates, heaters, chillers, and fans; Manage energy efficiency of heating, cooling, and electrical systems within buildings or campuses; Repair or replace wiring, equipment, and instruments safely to NEC standards.



Energy Systems Technology

**Career options:** Mechanic and Installer, Lead Site/Service Technician, Facility Energy Manager

**Degrees offered:** AAS degree in EST with concentration in Facilities Energy Management (100.4 credits)

**Industrial Mechanics** - Graduates of the Industrial Maintenance concentration will enter the workforce with the knowledge and skills to maintain and repair equipment and industrial machinery, such as: conveying systems, production machinery, and packaging equipment; control and operate plant equipment, such as: turbines, pumps, valves, gates, fans, and controllers; read blueprints or technical diagrams; identify electrical problems using a variety of testing devices; repair or replace wiring, equipment, and instruments safely to NEC standards using hand and power tools.

**Career options:** Assistant Technician/Mechanic, Industrial Maintenance/Machinery Mechanic, Systems Specialist, System/Facility Supervisor

**Degrees offered:** AAS degree in EST with concentration in Plant Operations (97.4 credits)

**Renewable Energy Technology** - The Renewable Energy Technology concentration provides students opportunities to gain the knowledge and skills needed to assemble and install renewable energy systems (solar, wind, hydro-electric, biofuel/ bioproducts); monitor and control/

adjust equipment to ensure optimal performance, including: turbines, pumps, valves, gates, fans, controllers, filters, and instruments; and; troubleshoot, diagnose, and repair or replace wiring and electrical, mechanical, and hydraulic equipment safely to NEC standards using a variety of testing devices and power tools.

**Career options:** Maintenance/Operations Technician; Systems Specialist; System/ Site Supervisor

**Degrees offered:** AAS degree in EST with concentration in Renewable Energy Technology (99.6 credits)



Photo courtesy of Puget Sound Energy

# Yakima Valley College

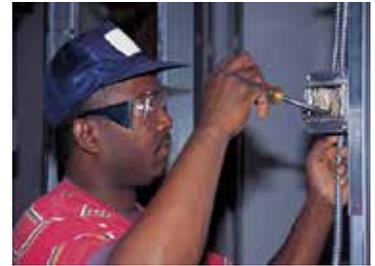
South 16th Ave. & Nob Hill Blvd, Yakima, WA 98902  
[www.yvcc.edu](http://www.yvcc.edu)



## Electrical Technology

**Electrical Technology** - The Electrical Technology program guides students through the steps required to become a construction or industrial maintenance electrician. With successful completion of this 24-month program at Perry Technical Institute and the required Yakima Valley Community College classes, students receive an Associate of Applied Science Degree in Electrical Technology. The diversified curriculum covers everything from electrical math and AC/DC fundamentals to National Electric Code and solid state electrical fundamentals. Gain valuable theory and hands-on application through classroom assignments, shop experience, and fieldwork.

In the two-year program, you'll learn how to install, connect, test, and maintain electrical systems for industrial, commercial, residential, process control, security, and communications. The Washington State Department of Labor and Industries recognizes two years of training toward journeyman certification.



Electricians work in nearly every industry. Work in the construction field, in industrial settings such as manufacturing plants, or for contractors maintaining and repairing existing electrical systems. The advent of new technologies, increased use of automation, and the need to retrofit outdated structures is increasing the demand for electricians.



**Career options:** Upon graduation, you'll be qualified to take a variety of career paths. You can work in the construction field; in industrial settings such as manufacturing plants; and for electrical contractors maintaining and repairing existing electrical systems. Electricians work in nearly every industry.

**Degree offered:** Associate of Applied Science: Electrical Technology

A partnership between Yakima Valley College and Perry Technical Institute provides students the opportunity to receive an Associate of Applied Science Degree in different technical areas. Students take the technical program at Perry Technical Institute and complete 32 credits at YVCC to receive an Associate of Applied Science Degree.

Perry Technical Institute  
2011 W Washington Ave.  
Yakima, WA  
[www.perrytech.edu](http://www.perrytech.edu)

Photos courtesy of Yakima Valley College

## Pre-Engineering Programs

Solve technical problems with Math & Science! Engineering is essentially solving problems by using science to design applications. These Colleges offer pre-engineering programs that cover the courses typical of the first two years of an engineering degree.

- Bellevue College** - [www.bellevuecollege.edu](http://www.bellevuecollege.edu)
- Bellingham Technical College** - [www.btc.edu](http://www.btc.edu)
- Cascadia Community College** - [www.cascadia.edu](http://www.cascadia.edu)
- Centralia College** - [www.centralia.edu](http://www.centralia.edu)
- Everett Community College** - [www.everettcc.edu](http://www.everettcc.edu)
- Green River Community College** - [www.greenriver.edu](http://www.greenriver.edu)
- Lake Washington Institute of Technology** - [www.lwtech.edu](http://www.lwtech.edu)
- Lower Columbia Community College** - [www.lowercolumbia.edu](http://www.lowercolumbia.edu)
- North Seattle Community College** - [www.northseattle.edu](http://www.northseattle.edu)
- Olympic College** - [www.olympic.edu](http://www.olympic.edu)
- Shoreline Community College** - [www.shoreline.edu](http://www.shoreline.edu)
- South Seattle Community College** - [www.southseattle.edu](http://www.southseattle.edu)
- Spokane Falls Community College** - [www.spokanefalls.edu](http://www.spokanefalls.edu)
- Tacoma Community College** - [www.tacomacc.edu](http://www.tacomacc.edu)
- Wenatchee Valley College** - [www.wvc.edu](http://www.wvc.edu)

## Scholarship Opportunities

**The Institute of Electrical and Electronics Engineers Power & Energy Society (IEEE PES)** - is an association dedicated to advancing innovation and technological excellence for the benefit of humanity. Student members have access to mentors, who are professionals in power engineering, and scholarships!

**IEEE-PES Scholarship Plus Initiative** – awardees receive up to \$7,000 over three years and opportunities for 2 – 3 years of career experience with leading industry employers. (<http://ieee-pes.org>)

**American Public Power Association (APPA)** - Public power is a collection of more than 2,000 community-owned electric utilities, serving more than 48 million people or about 14 percent of the nation's electricity consumers.

**Demonstration of Energy and Efficiency Developments (DEED)** - DEED offers four types of scholarships: Educational, Student Internship, Student Research Grant, and Technical Design Project. (<http://www.publicpower.org/>)

### **Educational Scholarships**

Provides funding to support the education of students working toward technical careers that are in short supply and high demand by electric utilities. \$2,000 per scholarship paid directly to student's university.

### **Student Internships**

These paid internships provide work experience at an electric utility sponsored by a DEED member utility. \$4,000 plus up to \$1,000 in travel funds to attend applicable conference.

### **Student Research Grants**

These student grants provide funding to support research in an energy-related project. \$4,000 plus up to \$1,000 in travel funds to attend applicable conference.

### **Technical Design Projects (TDP)**

Provides funding to support students working on a technical project of interest to electric utilities, especially engineering students working on their senior project. \$5,000 paid directly to student by DEED; up to \$3,000 in travel funds to share project results.

## Multi-Occupational Trade Degrees

Multi-occupational degrees provide journeymen-level workers with education designed to prepare them for advancement in their chosen field. These programs are suitable for candidates who have completed a Joint Apprenticeship Training Committee approved apprenticeship program with a minimum of 6,000 clock hours of instruction in technical skills and at least 432 clock hours of related supplemental classroom instruction. The following schools offer Multi-Occupational Degrees:

**Bates Technical College** (Apprenticeship Studies Degree)- [www.bates.ctc.edu](http://www.bates.ctc.edu); Partners: Sellen, Absher, Skanska, McKinstry, MacDonald Miller, GLY

**Columbia Basin College** - [www.columbiabasin.edu/index.aspx](http://www.columbiabasin.edu/index.aspx)

**Everett Community College** - [www.everettcc.edu](http://www.everettcc.edu); Partners: IAM/Boeing, Snohomish County PUD

**Renton Technical College** - [www.rtc.edu](http://www.rtc.edu); Partners: Sellen, Absher, Skanska, McKinstry, MacDonald Miller, GLY

**South Seattle College** - [www.southseattle.edu](http://www.southseattle.edu); Partners: Seattle City Light, Snohomish County PUD, Puget Sound Electrical, Sellen, Absher, Skanska, McKinstry, MacDonald Miller, GLY, IAM/Boeing

**Spokane Community College** - [www.ccs.spokane.edu](http://www.ccs.spokane.edu); Partners: Avista, Concrete Cutters inc, McKinstry Spokane, ACI NW, Coffman Engineers, ICON Corporation, Lydig Construction, Graham Construction, Garco Construction, IAM/Boeing

**Wenatchee Valley College** - [www.wvc.edu/default.asp](http://www.wvc.edu/default.asp); Partners: Chelan County PUD

## What is Apprenticeship?

"Apprenticeship is a combination of on-the-job training (OJT) and related classroom instruction under the supervision of a journey-level craft person or trade professional in which workers learn the practical and theoretical aspects of a highly skilled occupation." ~**Washington State Department of Labor & Industries**

The energy industry trades require skilled crafts people to perform jobs. Apprenticeship is a required training program for most of these journey level positions.

### Helpful resources for Apprentices:

**Washington State Department of Labor & Industries** - <https://www.lni.wa.gov/TradesLicensing/Apprenticeship/About/WhatIs/default.asp>

**Bonneville Power Administration Apprenticeships** - [www.bpa.gov/Careers/Apply/Pages/Apprenticeships.aspx](http://www.bpa.gov/Careers/Apply/Pages/Apprenticeships.aspx)

**Chelan County P.U.D. Apprenticeships** - [www.chelanpud.org/Apprenticeships.html](http://www.chelanpud.org/Apprenticeships.html)

**Idaho Power Apprenticeships** - [www.idahopower.com/Careers/Apprenticeships/descriptions.cfm](http://www.idahopower.com/Careers/Apprenticeships/descriptions.cfm)

**Seattle City Light Apprenticeships** - [www.seattle.gov/light/careers/apprentice/default.asp](http://www.seattle.gov/light/careers/apprentice/default.asp)

**Tacoma Public Utilities Apprenticeships** - [www.mytpu.org/jobs/tacoma-power-apprenticeships.htm](http://www.mytpu.org/jobs/tacoma-power-apprenticeships.htm)



## Community and Technical College Applied Bachelors Degrees

Applied bachelor's degrees fill skill gaps in practical, market-driven fields where job requirements have advanced beyond the associate degree level. They add junior and senior levels to two-year professional-technical (vocational) degrees that would otherwise not transfer and count toward bachelor's degrees at universities. The degrees vary from a two-year management track on top of a two-year technical education, or a continuation of a professional-technical degree.

**Cascadia College** - Bachelor of Applied Science in Sustainable Practices - This program is designed for students who have completed a two-year degree in a related subject or who meet the distribution requirements through prior college coursework. Students work closely with faculty and a dedicated advisor to complete 90 credits of upper division coursework such as "Social Perspectives on Sustainable Practices" and "Earth Systems and Global Climate Change". [www.cascadia.edu/programs/degrees/bassp.aspx](http://www.cascadia.edu/programs/degrees/bassp.aspx)

**South Seattle College** - Bachelor of Applied Science in Sustainable Building Science Technology - This program prepares students who have completed an apprenticeship program, a two-year technical degree or approved associate degree and have 2-5 years of related work experience. This unique, 90-credit degree prepares working adult students to apply expertise and systems knowledge to support highly technical building operations, focusing on the complexities of building science, energy codes, building codes and facility management. Students advance their careers in building functions and finance in order to manage structures that are healthier and more durable, efficient, economical, and sustainable. The degree is taught in a hybrid format, 80% online and 20% in person, with class meetings held at the Seattle Georgetown campus once a month. [www.southseattle.edu/programs/bas](http://www.southseattle.edu/programs/bas)

## Energy-Related Bachelors Degrees

**Central Washington University** - [www.cwu.edu/engineering/electronics-engineering-technology-program](http://www.cwu.edu/engineering/electronics-engineering-technology-program)

**Eastern Washington University** - [www.ewu.edu/cstem/programs/engineering](http://www.ewu.edu/cstem/programs/engineering)

**Evergreen State College** - [www.evergreen.edu/academics/home](http://www.evergreen.edu/academics/home)

**University of Washington** - [www.ee.washington.edu](http://www.ee.washington.edu)

**Western Washington University** - [energy.wvu.edu/programs](http://energy.wvu.edu/programs)

**Washington State University, Everett** - [everett.wsu.edu/majorsdegrees/electrical-engineering](http://everett.wsu.edu/majorsdegrees/electrical-engineering)

**Washington State University, Tri-Cities** - [tricitie.wsu.edu/electricalengineering](http://tricitie.wsu.edu/electricalengineering)

**Washington State University, Vancouver** - [ecs.vancouver.wsu.edu/electrical-engineering](http://ecs.vancouver.wsu.edu/electrical-engineering)



Chelan County PUD  
Rocky Reach Dam

# A Guided Pathway: Walla Walla Community College's Energy Systems Technology Degree Program

## Federal Grants Catalyze Program Advancement

The groundwork for the efforts described in this article was catalyzed by two federal grant consortiums that WWCC was a team member of between 2011-2017: 1) Advanced Hardwood Biofuels Northwest (AHB); and 2) Washington Integrated Sector Employment (WISE). AHB was funded by the United States Department of Agriculture's National Institute of Food and Agriculture and led by the University of Washington. AHB featured five Pacific Northwest regional universities and two industry partners. Its objective was to create the foundation for a renewable fuels and chemicals industry in the Northwest based on using hybrid poplar trees as the main biomass feedstock. The SBCTC's Agriculture Center of Excellence and WWCC were the team members designated to collaborate to develop associate degree-level training to build a workforce of skilled operators and technicians. The EST degree's Plant Operations concentration arose from AHB's efforts and 20 students graduated career-ready with the skills and knowledge necessary to secure relevant living wage employment in the Northwest.

Jason Selwitz Ph.D., Faculty Lead for the Energy Systems Technology Program, oversees an amazing new collection of degree programs at Walla Walla Community College (WWCC). This new program is one the WWCC programs that received support under the Washington Integrated Sector Employment (WISE) Grant, led by the Center of Excellence for Clean Energy. The WISE grant laid the groundwork for the efforts to re-organize these degrees. Under WISE, WWCC developed Career and Educational Navigator positions to provide recently dislocated and unemployed workers and/or Veterans with assistance on a range of existing state and federal support programs that are often difficult for students to access without timely and clear guidance and assistance. As a result of the empathetic yet aggressive academic counseling performed by the navigators to benefit EST students, attrition rates dropped while completion and job placement rates rose. WISE grant funding also supported instructor training to spur further professional development and the purchase of more than \$300,000 worth of technical teaching aids and equipment used in the shop to enhance delivery of EST course content.

As WWCC leverages state and federal support to better assist students and strengthen its programs, Energy Systems Technology students will become empowered to avail of high value training. Graduates will earn multi-faceted credentials in newly aligned content areas and secure relevant and rewarding employment in the Northwest.

## A Guided Pathway

At the onset of the 2017 to 2018 academic year, Walla Walla Community College (WWCC) re-engineered its Energy Systems Technology (EST) Department to feature just one Associate of Applied Science (AAS) degree program. In the past, WWCC had separate degrees in Refrigeration, Electrical, Wind Technology, Plant Operations, Industrial Maintenance, Precision Agriculture, and Irrigation. A common denominator for employers in the Pacific Northwest, is the craving for technicians and operators who maintain robust electrical, mechanical, and bio-chemical skills and are interested in lifelong learning. WWCC integrated the identified degree tracks into one degree program to: a) act on feedback from advisory boards and industry partners; b) provide students more effective academic advising; c) improve the coordination and efficient delivery of vital financial and social support services; d) reinforce the quality of courses and program offerings; e) integrate recommendations from research and practice on stacked and latticed credentials; f) strengthen job security for instructors; and g) reduce and/or eliminate orphaned courses serving single degree tracks.

## The Electrical Core

In the revised configuration, EST students now complete an electrical core certificate of 52.4 credits in year one. This “year one” core, i.e. a certificate in electrical systems, is a pre-requisite for a range of “year two” certificates.

As visualized, when a student completes the core electrical certificate, followed by completion of the course requirements for one or more “year two” certificates, the student completes an AAS degree in Energy Systems Technology with concentration in one or more specified training areas.

EST's Electrical Systems core certificate: 52.4 credits		
Q1:	EST 145 EST 131 AMATH 107 (M) EST 260	Industrial Safety/Material Handling Electrical Theory Applied Mathematics National Electrical Code
Q2:	EST 132 AENG 100 (W+J) ENT 112 Elective	Electrical Applications Applied Writing Blueprint Reading TBD per concentration
Q3:	EST 133 EST 150 IFA 022 ACOM 102 (O/R/L) Elective	Electrical Controls Motors/Motor Maintenance Industrial First Aid Applied Communications TBD per concentration

## Multiple Degree Concentrations

Through training within the following degree concentrations, graduates of the EST degree program are in high demand by municipal public works, power generation utilities, food and beverage processors, pulp and paper mills, farms and ranches, irrigation service providers, renewable energy facilities, and manufacturers of advanced products:

1. Mechanical Electrical
2. Plant Operations
3. Renewable Energy
4. Industrial Mechanics
5. Facilities Energy Management
6. Cellar Maintenance
7. Center Pivot Irrigation
8. Precision Agriculture

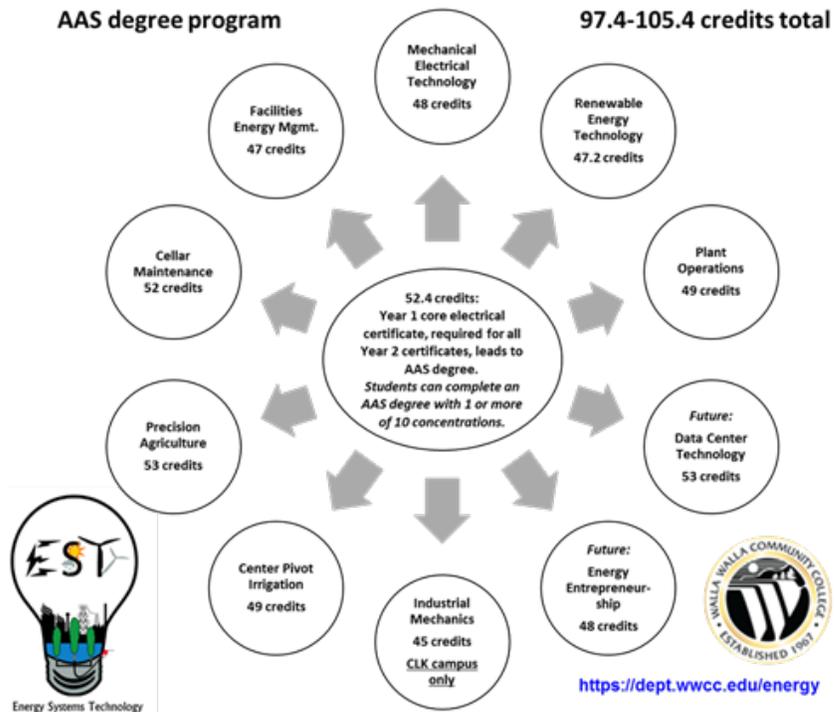
EST students gain hands-on practice monitoring, adjusting, and controlling equipment, such as: turbines, pumps, valves, gates, fans, controllers, filters, conveyors, emitters, drones, robots, and instruments -- to ensure optimal performance of energy systems. Students build the skills and knowledge to begin troubleshooting, diagnosing, and repairing or replacing electrical and mechanical equipment safely using appropriate testing devices and power tools.

Graduates enter the workforce having gained experience and possess the tools to calculate, measure, and process a variety of materials to generate high value products, including: electricity, bioproducts, treated water, crops, foods and beverages, paper products, and renewable energy.

## WWCC's Energy Systems Technology guided pathway

AAS degree program

97.4-105.4 credits total



## Stacked and Latticed Credentials

A stacked set of credentials occurs when multiple certificates are sequenced together to build a student's formal record of acquired skills and knowledge. For example, the EST "year one" electrical certificate is the core of all "year two" concentrations leading to the EST degree. In this model, students can complete (or stack) one or more "year two" certificates/concentrations on to this first year electrical core.

There is a spectrum

of overlap between each concentration's requirements. EST students can complete one or two short certificates as an entry point to the first year electrical core certificate and/or even as a starting point to fulfill a portion of their degree concentration requirements.

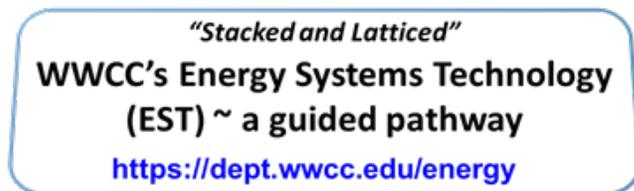
Latticed credentials occur when two or more degree programs join forces to utilize their respective courses to form a new credential. Examples include:

- Coupling plant and soil science degree requirement courses with those from geographic information systems and EST to form the precision agriculture concentration;
- Tying together water technology and management and agriculture courses with EST courses to form the center pivot irrigation concentration;
- Incorporating a series of three precision machining courses within the EST concentration in industrial mechanics leading to an additional machining/millwright endorsement; and
- Embedding new short certificates in entrepreneurship and data center technology from the business and computer science departments into planned concentrations for the EST degree.

These credentials cut across multiple disciplines and provide students marketable skills outside of their home base degree or department. These "latticed" credentials make it easier for students to earn multiple formal endorsements, certifications, and/or degrees in often seemingly unaligned disciplines. As students complete courses for the EST concentrations listed, they are completing requirements for a secondary certificate or degree program in addition to their primary credential of focus.

## Incumbent Worker Training

During the 2017-2018 academic year, the Washington State Board for Technical and Community Colleges (SBCTC) formally approved the WWCC Energy Systems Technology AAS degree program



**Entry**

Short Certificates: Incumbent Worker continuing education

- Mechanical Electrical Technician
- Cellar Master

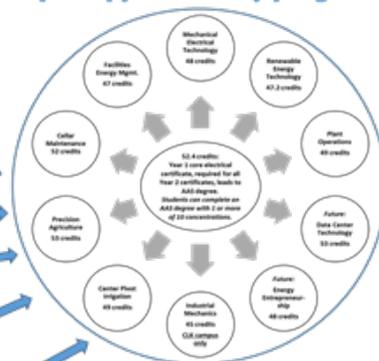
HS graduates

Career Change Seekers

English Language Assistance

GED or Dual Credit HS students

EST AAS degree program:  
**97.4-105.4 credits total**  
*a pre-Apprenticeship program*



WA Career Bridge -- Eligible Training Provider:

[http://www.careerbridge.wa.gov/Detail\\_Program.aspx?program=5480](http://www.careerbridge.wa.gov/Detail_Program.aspx?program=5480)

**Exit**

Options post-completion of Energy Systems Technology AAS degree:

- Job/Career
- Apprenticeship
- AAS Ag. Business
- AAS Plant & Soil Science
- AAS Enology & Viticulture
- AAS Business
- AAS Computer Science
- AAS-T Plant Operations
- BAS Sustainable Agriculture Systems
- BAS Applied Mgmt. & Entrepreneurship
- Transfer to a university



as an Integrated Basic Education Skills and Training (I-BEST) pathway. In the application, WWCC presented the EST program as a guided pathway model where one degree includes multiple concentrations of training for job/career specialization. With the added value of the I-BEST approval, EST is beginning to offer night courses for incumbent workers seeking continuing education and/or professional development. The night courses include labs facilitated by two bilingual instructors who are able to provide contextualized support in reading, writing, and arithmetic to students in a contextualized, technical workforce-type setting. To buffer this component, WWCC is starting to build corporate partnerships to secure small groups of workers from multiple employers to anchor course enrollment. This component of the EST program is offered through a proposed short certificate for "Mechanical Electrical Technicians" where students must earn a minimum of 20 credits over four quarters of I-BEST enabled night courses. Long-term, the program's objective is for a student in this short certificate program to continue his/her education at the degree level as all the courses required for the short certificate are also required for the all-encompassing AAS degree pathway.

A similar program is fermenting through collaboration between the EST program and WWCC's Enology and Viticulture (EV) program. Together, EST and EV hope to offer a "choose your own adventure"- type short certificate for professionals in the food and beverage processing industry who seek targeted skill development and career advancement training in course topics such as: electrical applications, industrial mechanics, pumps, wastewater treatment, industrial safety, controls, motors, hydraulics and pneumatics, refrigeration basics, and/or process control instrumentation and troubleshooting. This short certificate for "Cellar Masters" will launch formally in early 2019 and will also be open to EV students working through their AAS or transfer degrees.

### Targeted Support

Component to the I-BEST application to the SBCTC, the EST AAS degree program was considered for approval for the Opportunity Grant program which "helps low-income adults train for high-wage, high-demand careers": [www.sbctc.edu/colleges-staff/programs-services/opportunity-grant/](http://www.sbctc.edu/colleges-staff/programs-services/opportunity-grant/). After a review of the course requirements for each degree concentration and the supplemental industry data provided, every degree concentration was designated "high demand for employment." As a result, WWCC EST students now can qualify for support through the State of Washington's Opportunity Grant. Furthermore, the Energy Systems Technology AAS degree program is listed as an Eligible Training Provider (ETP) through Washington Career Bridge which enables current and prospective students to avail of additional state support: [www.careerbridge.wa.gov/Detail\\_Program.aspx?program=5480](http://www.careerbridge.wa.gov/Detail_Program.aspx?program=5480).

In early 2018, the National Science Foundation awarded WWCC a five-year Science, Technology, Engineering, and Mathematics Scholarships grant. The EST program is the hub of this nearly \$650,000 program which intends to provide scholarships to three cohorts of 20 low-income, academically talented students who are US Citizens or permanent residents at least 18 years old. The scholarship program will help enhance opportunities for women, minorities, career change seekers, and those in dual enrollment programs who are interested in pursuing associate-level degrees in watershed ecology, engineering, energy systems technology, and plant and soil science.

For more information on EST and the efforts described, please contact the faculty lead:



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<https://dept.wwcc.edu/energy>

# National Energy Career Websites

**Society of Women Engineers** - [www.societyofwomenengineers.swe.org](http://www.societyofwomenengineers.swe.org)

**Get Into Energy** - [www.getintoenergy.jobs](http://www.getintoenergy.jobs)

**Department of Energy** - [www.energy.gov](http://www.energy.gov)

**Energy Central** - [www.energycentraljobs.com](http://www.energycentraljobs.com)

**Northwest Public Power Administration** - [www.nwppa.org](http://www.nwppa.org)

**Energy Job Search** - [www.thinkenergygroup.com](http://www.thinkenergygroup.com)

**Careers in Wind Energy** - [www.awea.org](http://www.awea.org)

**Careers in Hydropower** - [www.hydro.org](http://www.hydro.org)

## Energy Industry Employers in Washington - ([www.cleanenergyexcellence.org/jobboard](http://www.cleanenergyexcellence.org/jobboard))

**Atlantic Power Corporation** - Private Electric - [www.atlanticpower.com](http://www.atlanticpower.com)

**Avista** - Private Electric - [www.avistacorp.com](http://www.avistacorp.com)

**Benton County PUD** - PUD Electric - [www.bentonpud.org](http://www.bentonpud.org)

**Big Bend Electric Cooperative Inc.** - Cooperative Electric - [www.bb.ec.org](http://www.bb.ec.org)

**Blaine City Light** - Municipal Electric - [www.cityofblaine.com](http://www.cityofblaine.com)

**Bonneville Power Administration (BPA)** - Wholesale Electric - [www.bpa.gov](http://www.bpa.gov)

**Bureau of Indian Affairs (BIA)** - Federal Entity - [www.bia.gov](http://www.bia.gov)

**Bureau of Reclamation** - Federal Entity - [www.usbr.gov](http://www.usbr.gov)

**Centralia City Light** - Municipal Electric - [www.cityofcentralia.com](http://www.cityofcentralia.com)

**Chelan County PUD** - PUD Electric - [www.chelanpud.org](http://www.chelanpud.org)

**Cheney Power** - Municipal Electric - [www.cityofcheney.org](http://www.cityofcheney.org)

**City of Cashmere** - Municipal Electric - [www.cityofcashmere.org](http://www.cityofcashmere.org)

**City of Ellensburg** - Municipal Electric - [wa-ellensburg.civicplus.com](http://wa-ellensburg.civicplus.com)

**City of McCleary** - Municipal Electric - [www.cityofmccleary.com](http://www.cityofmccleary.com)

**City of Milton** - Municipal Electric - [www.cityofmilton.net](http://www.cityofmilton.net)

**City of Richland** - Municipal Electric - [www.ci.richland.wa.us](http://www.ci.richland.wa.us)

**City of Sumas** - Municipal Electric - [cityofsumas.homestead.com](http://cityofsumas.homestead.com)

**Clallam County PUD** - PUD Electric - [www.clallampud.net](http://www.clallampud.net)

**Clark County PUD** - PUD Electric - [www.clarkpublicutilities.com](http://www.clarkpublicutilities.com)

**Columbia REA** - Cooperative Electric - [www.columbiarea.com](http://www.columbiarea.com)

**Covanta Energy** - Private/Electric - [www.covanta.com](http://www.covanta.com)

**Cowlitz County PUD** - PUD Electric - [www.cowlitzpud.org](http://www.cowlitzpud.org)

**Douglas County PUD** - PUD Electric - [www.douglaspud.org](http://www.douglaspud.org)

**Elmhurst Mutual Power & Light Co.** - Cooperative Electric - [www.elmhurstmutual.org](http://www.elmhurstmutual.org)

**Enel North America Inc.** - Private/Electric - [www.enelgreenpower.com](http://www.enelgreenpower.com)  
**Energy Northwest** - Private/Electric - [www.energy-northwest.com](http://www.energy-northwest.com)  
**Enwave Seattle** - Private/Electric - [www.enwaveseattle.com](http://www.enwaveseattle.com)  
**Ferry County PUD** - PUD Electric - [www.fcpud.com](http://www.fcpud.com)  
**Grant County PUD** - PUD Electric - [www.grantpud.org](http://www.grantpud.org)  
**Grays Harbor County PUD** - PUD Electric - [www.ghpud.org](http://www.ghpud.org)  
**Inland Power & Light** - Cooperative Electric - [www.inlandpower.com](http://www.inlandpower.com)  
**Jefferson County PUD** - PUD Electric - [www.jeffpud.org](http://www.jeffpud.org)  
**Kittitas County PUD** - PUD Electric - [www.kittitaspud.com](http://www.kittitaspud.com)  
**Klickitat County PUD** - PUD Electric - [www.klickitatpud.com](http://www.klickitatpud.com)  
**Kootenai Electric Cooperative Inc.** - Cooperative Electric - [www.kec.com](http://www.kec.com)  
**Lewis County PUD** - PUD Electric - [www.lcpud.org](http://www.lcpud.org)  
**Mason County PUD #3** - PUD Electric - [www.masonpud3.org](http://www.masonpud3.org)  
**McKinstry** - Design/Build/Operate/Maintain - [www.mckinstry.com](http://www.mckinstry.com)  
**Modern Electric Water Company (Spokane Valley)** - Cooperative Electric - [www.mewco.com](http://www.mewco.com)  
**Nespelem Valley Electric Cooperative** - Cooperative Electric - [www.nvec.org](http://www.nvec.org)  
**Okanogan PUD** - PUD Electric - [www.okanoganpud.org](http://www.okanoganpud.org)  
**Orcas Power & Light** - Cooperative Electric - [www.opalco.com](http://www.opalco.com)  
**Pacific County PUD** - PUD Electric - [www.pacificpud.org](http://www.pacificpud.org)  
**PacifiCorp** - Private/Electric - [www.pacificcorp.com](http://www.pacificcorp.com)  
**Pend Oreille PUD** - PUD Electric - [www.popud.org](http://www.popud.org)  
**Peninsula Light Company** - Cooperative Electric - [www.penlight.org](http://www.penlight.org)  
**Port Angeles City Light** - Municipal Electric - [wa-portangeles.civicplus.com](http://wa-portangeles.civicplus.com)  
**Puget Sound Energy** - Private/Electric - [www.pse.com](http://www.pse.com)  
**Seattle City Light** - Municipal Electric - [www.seattle.gov/light](http://www.seattle.gov/light)  
**Skamania PUD** - PUD Electric - [www.skamaniapud.com](http://www.skamaniapud.com)  
**Snohomish County PUD** - PUD Electric - [www.snopud.com](http://www.snopud.com)  
**Tacoma Power** - Municipal Electric - [www.mytpu.org](http://www.mytpu.org)  
**Tanner Electric Cooperative** - Cooperative Electric - [www.tannerelectric.coop](http://www.tannerelectric.coop)  
**Tenaska Washington Partners II, L.P.** - Private/Electric - [www.tenaska.com](http://www.tenaska.com)  
**Town of Eatonville** - Municipal Electric - [www.eatonville-wa.gov](http://www.eatonville-wa.gov)  
**Town of Steilacoom** - Municipal Electric - [www.townofsteilacoom.com](http://www.townofsteilacoom.com)  
**Transalta** - Independent Power Plant - [www.transalta.com](http://www.transalta.com)  
**United States Army Corps of Engineers** - Federal Entity - [www.usace.army.mil](http://www.usace.army.mil)  
**Vera Water & Power** - PUD Electric - [www.verawaterandpower.com](http://www.verawaterandpower.com)  
**Wahkiakum County PUD** - PUD Electric - [www.wahkiakumpud.org](http://www.wahkiakumpud.org)  
**Whatcom County PUD** - PUD Electric - [www.pudwhatcom.org](http://www.pudwhatcom.org)



## Washington State Community and Technical Colleges

Colleges in **green** offer energy and electrical programs

- |  |   |                                   |
|--|---|-----------------------------------|
| <b>1 - Bates Technical College</b>       | <b>13 - Green River College</b>         | 25 - Skagit Valley College        |
| 2 - Bellevue College                     | 14 - Highline College                   | 26 - South Puget Sound CC         |
| <b>3 - Bellingham Technical College</b>  | 15 - Lake Washington Institute of Tech. | <b>27 - South Seattle College</b> |
| <b>4 - Big Bend CC</b>                   | <b>16 - Lower Columbia College</b>      | <b>28 - Spokane CC</b>            |
| <b>5 - Cascadia College</b>              | <b>17 - North Seattle College</b>       | 29 - Spokane Falls CC             |
| <b>6 - Centralia College</b>             | 18 - Olympic College                    | 30 - Tacoma CC                    |
| 7 - Clark College                        | <b>19 - Peninsula College</b>           | <b>31 - Walla Walla CC</b>        |
| <b>8 - Clover Park Technical College</b> | 20 - Pierce College-Fort Steilacoom     | 32 - Wenatchee Valley College     |
| <b>9 - Columbia Basin College</b>        | 21 - Pierce College-Puyallup            | 33 - Whatcom CC                   |
| 10 - Edmonds CC                          | 22 - Renton Technical College           | <b>34 - Yakima Valley College</b> |
| 11 - Everett CC                          | 23 - Seattle Central College            |                                   |
| 12 - Grays Harbor College                | <b>24 - Shoreline CC</b>                |                                   |

Courtesy State Board for Community and Technical Colleges at <http://www.sbctc.ctc.edu>

**For the most current information, visit  
<http://cleanenergyexcellence.org/CollegePrograms>**