

## CLEAN ENERGY CAREERS?

*Fossil fuels meet most of our energy needs. Now we're transitioning to solar, wind, & other renewable energy sources, plus using all energy more efficiently.*

### Why?

To cut greenhouse gas emissions, gain energy independence and/or save money.

### What are they?

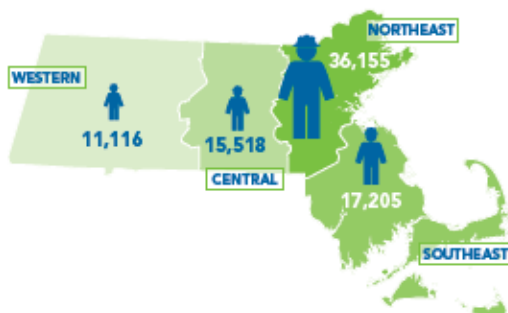
Jobs in renewable energy and energy efficiency goods, services and processes.

### Growth?

10.5% growth in employment during 2013-2014 - from the 2014 MA Clean Energy Industry Report. 47% expansion since 2010.

The MVWIB STEM Careers in Clean Energy Program will make sure **YOU** succeed in this sector!

### Clean Energy Workers by Region



## Explore the Possibilities of a Clean Energy Career!

- Solar Photovoltaics
- Solar Inverters
- Wind Turbines
- Hydropower
- Wave Power
- Heat pumps
- Geothermal
- Residential & commercial energy efficiency
- Solar thermal
- High efficiency vehicles
- Combined heat & power plants
- Biomass electricity
- Electrical transmission & distribution
- Ethanol
- Hydrogen cell
- Energy star appliances
- LEED construction
- Sustainability management
- Clean energy legislation
- Clean energy law
- Energy Security
- Clean energy regulations enforcement & management

### STEM Careers in Clean Energy Program

Brought to you by:



For more information contact:

Susan Almono / Cristy Gomez  
439 S. Union Street, Suite 102  
Lawrence, MA 01843

Phone: 978-682-7099  
Email: [salmono@mvwib.org](mailto:salmono@mvwib.org)

## \*STEM

Science, Technology, Engineering & Math



# CLEAN ENERGY CAREERS

*Chose a growth sector for your future!!*



## Can I find my dream job?

Find it on a **STEM \***  
clean energy career path.



Engineering  
and Design

Technical (manufacture,  
installation, operations,  
maintenance,  
construction)



Administration  
and sales

Research and  
Development



Management  
and professional

### Find clean energy jobs on your own:

- Mass CEC Jobs Board
- Massachusetts Job Quest – Green Jobs
- Indeed.com—Renewable Energy

## What education do I need?

(More education = higher wages)  
Examples:

Get a **CERTIFICATE** to start climbing the clean energy career ladder.

- NABCEP Entry Level Certificate to work in solar electricity.
- BPI Insulation & Air Sealing Technician Certificate for residential energy efficiency.
- LEED Green Associate Certificate for efficient building design & construction.
- Computer Aided Design Certificate To design components & energy systems.

Get an **ASSOCIATE'S** to move up.

- Energy Utility Technology at North Shore Community College in Danvers.
- Energy Management at Mt. Wachusett Community College in Devens.

Get a **BACHELOR'S** to soar.

- Energy Management Technology at Fitchburg State College.
- Environmental Science at UMASS Boston.
- Sustainable Design at Boston Architectural Col.
- Energy Systems Engineering at Mass Maritime Academy in Buzzard's Bay.

Find a full listing in the:

- MA Clean Energy Careers Training & Education Directory

## Are there clean energy companies to work for in MA?

Examples:

### Solar companies:

Solectria in Lawrence: Work in assembly, failure analysis, engineering, CAD design.

Nexamp in North Andover: Work in commercial solar electricity system design, project management, sales.

### Energy Efficiency firms:

ERS in North Andover: Be a commercial energy management & assessment consultant.

Advanced Building Analysis in Amesbury: Be a HERS Rater to check homes for efficiency.

Polar Bear Insulation in Methuen: Be an insulation technician!

Next Step Living in Boston: Work in sales outreach, residential energy assessment & efficiency upgrades, plus residential solar.

### Hydroelectric companies:

Enel Green Power in Andover: Work in hydro-electricity with a multinational corporation.

### Electric vehicle companies:

Voltrek in Andover: Help develop electric vehicle charging stations infrastructure.

### Look up MA clean energy firms on:

- the New England Clean Energy Council Members & Sponsors website tab

# ELECTRIC POWER | TRANSMISSION AND DISTRIBUTION

Wage data is from the Minnesota Department of Employment and Economic Development's 2nd Quarter 2009 Occupational Employment Statistics Survey

## ENGINEERS AND TECHNICIANS

Principal Engineer | \$46.72-\$66.90/hr.  
Reliability and Standards Engineer | \$46.72-\$66.90/hr.  
Transmission Planning Engineer | \$32.41-\$48.49/hr.  
Transmission Planning Technician | \$21.77-\$31.15/hr.  
Transmission or Distribution Line Design Engineer | \$32.41-\$48.49/hr.  
CAD Designer | \$20.13-\$31.49/hr.  
Substation Engineer | \$32.41-\$48.49/hr.  
System Protection Engineer | \$32.41-\$48.49/hr.  
Relay Protection Technician | \$28.46-\$36.53/hr.  
Field Technician | \$21.77-\$31.15/hr.



## OPERATION AND CONTROL

System Operations Manager | \$32.02-\$68.25/hr.  
Reliability Coordinator | \$33.70-\$49.88/hr.  
Network Reliability Lead | \$33.70-\$49.88/hr.  
Balancing Authority Operator | \$23.76-\$42.04/hr.  
System Control Operator | \$26.40-\$38.08/hr.  
Outage Coordination Dispatcher | \$26.40-\$38.08/hr.  
Control Center Support Technician | \$18.09-\$27.27/hr.



## SAFETY AND TRAINING

Training Coordinator | \$39.52-\$58.59/hr.  
Training and Development Specialist | \$21.77-\$33.63/hr.  
Safety and Occupational Health Coordinator | \$25.92-\$37.31/hr.



## FACILITIES CONSTRUCTION AND MAINTENANCE

Substation Mechanic | \$28.46-\$36.53/hr.  
Substation Mechanic Assistant | \$12.50-\$20.28/hr.  
Millwright | \$19.01-\$31.15/hr.  
Numerical Control Technician | \$15.91-\$22.72/hr.  
Electric Equipment Tester | \$13.24-\$20.00/hr.  
Machinist | \$16.45-\$24.38/hr.  
Welder | \$15.34-\$21.61/hr.  
Vegetation Specialist | \$22.35-\$32.95/hr.  
Laborer | \$15.18-\$27.28/hr.  
Truck Driver | \$15.48-\$23.03/hr.  
Transmission Line Maintenance Supervisor | \$22.99-\$34.83/hr.  
Line Worker | \$26.16-\$35.30/hr.  
Line Worker Apprentice | \$26.16-\$35.30/hr.  
Utility Worker | \$19.06-\$29.96/hr.



## BUSINESS ADMINISTRATIVE AND RELATED

Department Director | \$32.02-\$68.25/hr.  
Transmission Business Relations Manager | \$32.02-\$68.25/hr.  
Transmission Account Representative | \$30.83-\$56.20/hr.  
Regulatory Compliance Analyst | \$36.95-\$60.07/hr.  
Utility Forecaster | \$26.75-\$44.20/hr.  
Energy Transmission Accountant | \$23.47-\$34.80/hr.  
Economic Expansion Analyst | \$22.74-\$34.77/hr.  
Estimator | \$21.27-\$34.67/hr.  
Siting, Land Rights, and Permitting Agent | \$13.57-\$24.02/hr.  
Administrative Assistant | \$17.61-\$24.53/hr.  
Software Engineer | \$38.47-\$55.54/hr.  
Control Systems Programmer | \$29.21-\$43.57/hr.



## LEARN MORE ABOUT ELECTRIC POWER TRANSMISSION AND DISTRIBUTION CAREERS

Click on a career title above to find job-specific details like job descriptions, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the electric power transmission and distribution career pathway tool at:

[www.iseek.org/industry/energy/careers/careers-in-electric.html](http://www.iseek.org/industry/energy/careers/careers-in-electric.html)

THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT



# COMMERCIAL | ENERGY EFFICIENCY CAREERS

Wage data is from the Minnesota Department of Employment and Economic Development's 2nd Quarter 2009 Occupational Employment Statistics Survey

## MANAGEMENT / PROFESSIONAL SERVICES

Chief Financial Officer | \$57.69 or higher/hr.  
General Operations Manager | \$32.02-\$68.25/hr.  
Program Manager | \$32.02-\$68.25/hr.  
Project Manager | \$33.63-\$51.28/hr.  
Energy Efficiency Software Engineer | \$38.47-\$55.54/hr.  
Energy Services Sales Representative | \$30.83-\$56.20/hr.  
Horticulturist | \$22.51-\$48.55/hr.  
Energy Efficiency Planner | \$18.32-\$31.83/hr.



## HVAC MAINTENANCE AND INSTALLATION

HVAC Field Supervisor | \$22.99-\$34.83/hr.  
HVAC Technician | \$20.90-\$29.25/hr.  
Sheet Metal Worker | \$18.96-\$35.08/hr.  
HVAC Assistant | \$9.31-\$14.80/hr.  
Pipefitter/Steamfitter | \$20.40-\$37.60/hr.  
Pipefitter/Steamfitter Assistant | \$10.76-\$18.13/hr.



## ENGINEERING AND DESIGN

Engineering Manager | \$46.72-\$66.90/hr.  
Mechanical Engineer | \$28.47-\$43.33/hr.  
Mechanical Engineering Technician | \$20.73-\$30.95/hr.  
Energy Engineer | \$33.70-\$49.88/hr.  
Energy Analyst | \$18.32-\$31.83/hr.  
Technical Analyst | \$20.73-\$30.95/hr.  
Architect | \$25.66-\$45.05/hr.  
Architectural Design and Drafting Technician | \$18.37-\$28.92/hr.  
Building Commissioning Engineer | \$28.47-\$43.33/hr.  
Building Commissioning Technician | \$20.73-\$30.95/hr.



THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT

## GENERAL LABOR / MISC.

Foreman | \$24.75-\$37.14/hr.  
Roofer | \$17.32-\$32.43/hr.  
Roofer Assistant | \$13.59-\$18.87/hr.  
Window Installer | \$17.58-\$34.49/hr.  
Hazardous Materials Removal Worker | \$19.70-\$31.73/hr.



## BUILDING OPERATION MAINTENANCE & CONTROL

Building Controls Engineer | \$34.45-\$50.64/hr.  
HVAC/Building Controls Technician | \$21.42-\$30.23/hr.  
Chief Engineer | \$22.99-\$34.83/hr.  
Building Engineer | \$22.84-\$29.89/hr.  
Building Operator | \$15.39-\$22.83/hr.  
Control and Valve Installer & Repairer | \$20.30-\$33.46/hr.



## LIGHTING

Lighting Design Engineer | \$32.41-\$48.49/hr.  
Lighting Design Technician | \$21.77-\$31.15/hr.  
Lighting Design Leader | \$18.32-\$31.83/hr.  
Electrician | \$22.27-\$33.74/hr.  
Electrician Assistant | \$12.50-\$20.28/hr.



### LEARN MORE ABOUT COMMERCIAL ENERGY EFFICIENCY CAREERS

Click on a career title above to find job-specific details like job descriptions, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the commercial energy efficiency career pathway tool at:

<http://www.iseek.org/industry/energy/careers/careers-in-commercial.html>

# RESIDENTIAL | ENERGY EFFICIENCY CAREERS

Wage data is from the Minnesota Department of Employment and Economic Development's 2nd Quarter 2009 Occupational Employment Statistics Survey

## HVAC MAINTENANCE AND INSTALLATION

HVAC Field Supervisor | \$22.99-\$34.83/hr.

↻ HVAC Technician | \$20.90-\$29.25/hr.

↻ Sheet Metal Worker | \$18.96-\$35.08/hr.

↻ HVAC Assistant | \$9.31-\$14.80/hr.

Pipefitter/Steamfitter | \$20.40-\$37.60/hr.

↻ Pipefitter/Steamfitter Assistant | \$10.76-\$18.13/hr.

Hazardous Materials Removal Worker | \$19.70-\$31.73/hr.

Home Appliance Installation & Repair Worker | \$15.72-\$23.61/hr.



## MANAGEMENT & PROFESSIONAL SERVICES

General Operations Manager | \$32.02-\$68.25/hr.

↻ Program Manager | \$32.02-\$68.25/hr.

↻ Project Manager | \$33.63-\$51.28/hr.

Architect | \$25.66-\$45.05/hr.

↻ Architect Drafting & Design Technician | \$18.37-\$28.92/hr.

Loan Officer | \$21.49-\$38.81/hr.

Marketing/Outreach Specialist | \$21.74-\$34.50/hr.

Cost Estimator | \$21.27-\$34.67/hr.



## LANDSCAPE DESIGN

Horticulturist | \$22.51-\$48.55/hr.

Landscape Architect | \$20.01-\$33.84/hr.

↻ Landscaping & Groundskeeping Supervisor | \$17.73-\$26.12/hr.

↻ Landscaping & Groundskeeping Worker | \$10.10-\$16.08/hr.



## RETROFITTING & CONSTRUCTION

General Contractor | \$33.63-\$51.28/hr.

↻ Retrofitting and Construction Field Supervisor | \$24.75-\$37.14/hr.

Carpenter | \$16.23-\$27.43/hr.

↻ Carpenter Assistant | \$11.20-\$14.98/hr.

Electrician | \$22.27-\$33.74/hr.

↻ Electrician Assistant | \$12.50-\$20.28/hr.

Roofer | \$17.32-\$32.43/hr.

↻ Roofer Assistant | \$13.59-\$18.87/hr.

Window Installer | \$16.23-\$27.43/hr.

Cement Mason | \$15.78-\$27.15/hr.

Construction Equipment Operator | \$19.06-\$29.96/hr.

Siding Installation Worker | \$16.23-\$27.43/hr.

Insulation Worker | \$13.88-\$22.38/hr.

Construction Laborer | \$15.18-\$27.28/hr.



## WEATHERIZATION

Weatherization Program Manager | \$23.94-\$39.71/hr.

↻ Weatherization Monitor | \$18.32-\$31.83/hr.

↻ Home Energy Auditor | \$18.32-\$31.83/hr.

Weatherization Field Supervisor | \$22.99-\$34.83/hr.

↻ Weatherization Technician | \$16.23-\$27.43/hr.

↻ Weatherization Outreach Specialist | \$11.26-\$16.26/hr.



THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT

## LEARN MORE ABOUT RESIDENTIAL ENERGY EFFICIENCY CAREERS

Click on a career title above to find job-specific details like job descriptions, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the residential energy efficiency career pathway tool at:

[www.iseek.org/industry/energy/careers/careers-in-residential.html](http://www.iseek.org/industry/energy/careers/careers-in-residential.html)

## Education

## Manufacturing

## Installation

General Operations  
& Maintenance

## Research &amp; Development/Other

**Bachelor  
Degree**4+ Years Post High  
School Education &  
Experience**Production Mgr**  
\$32-\$37/hr.**Electrical Engineer**  
\$29-\$42/hr.**Controller**  
\$42-\$52/hr.**Plant Operations Mgr**  
\$29-\$37/hr.**Mechanical Engineer**  
\$27-\$35/hr.**Electrical Engineer**  
\$29-\$42/hr.**Director Wind Dev**  
\$36-\$50/hr.**Mechanical Engineer**  
\$27-\$35/hr.**Environmental Engineer**  
\$23-\$34/hr.**Project Engineer**  
\$25-\$29/hr.**Legal Assistance**  
\$32-\$50/hr.**Associate  
Degree**2+ Years Post High  
School Education &  
Experience**1st Line Supervisor**  
\$19-\$24/hr.**Project Manager**  
\$20-\$32/hr.**Transmission Design Eng**  
\$31-\$40/hr.**Mech Engineering Tech**  
\$18-\$21/hr.**Aeronautical Engineer**  
\$30-\$35/hr.**Elec Engineering Tech**  
\$18-\$21/hr.**Wind Turbine Technician**  
\$18-\$24/hr.**Renewable Energy Tech**  
\$18-\$25/hr.**Electrical Engineer**  
\$29-\$42/hr.**Technical Diploma**Long-Term  
On-the-Job  
Training**Wind Turbine Machinist**  
\$13-\$20/hr.**Battery Install & Maint**  
\$12-\$16/hr.**Meteorologist**  
\$26-\$49/hr.**Millwright**  
\$19-\$26/hr.**Field Operations Mgr**  
\$23-\$27/hr.**Electrician**  
\$15-\$25/hr.**Environmental Officer**  
\$23-\$37/hr.**Iron/Steel Worker**  
\$17-\$27/hr.**Iron/Steel Worker**  
\$17-\$27/hr.**Wind Field Service Tech**  
\$15-\$24/hr.**Welder**  
\$13-\$22/hr.**Electrician**  
\$15-\$25/hr.Some Post High School  
Education & ExperienceApprenticeship  
Program**Turbine Machinist**  
\$13-\$20/hr.**Welder**  
\$13-\$22/hr.**Moderate-Term  
On-the-Job Training****Sheet Metal Worker**  
\$17-\$26/hr.**CNC Machine Operator**  
\$15-\$27/hr.**Equipment Operator**  
\$15-\$24/hr.**Gen Maint & Repair**  
\$14-\$18/hr.**Gen Maint & Repair**  
\$14-\$18/hr.**Construction Laborer**  
\$14-\$19/hr.**Customer Service Rep**  
\$13-\$16/hr.**Machine Tool Setter**  
\$13-\$16/hr.**Customer Service Rep**  
\$13-\$16/hr.**Team Assembler**  
\$11-\$14/hr.**Team Assembler**  
\$11-\$14/hr.**Short-Term  
On-the-Job Training**Most Positions  
Require High School  
Diploma or GED**Production Planner**  
\$17-\$21/hr.**Industrial Truck Driver**  
\$12-\$15/hr.**Industrial Truck Driver**  
\$12-\$15/hr.**Truck Transportation**  
\$14-\$19/hr.**Truck Transportation**  
\$14-\$19/hr.**Production Composite**  
\$11-\$19/hr.**Generator Installer**  
\$11-\$17/hr.**Material Mover**  
\$11-\$13/hr.**Elec Equip Assembler**  
\$10-\$14/hr.



# SOLAR | HEATING & COOLING CAREERS

Wage data is from the Minnesota Department of Employment and Economic Development's Occupational Employment Survey. Wages updated to second quarter, 2011.

## ADMINISTRATIVE, SALES, AND MANAGEMENT

General Manager | \$31.64-\$65.67  
Marketing Manager | \$44.96-\$68.92  
Sales Manager | \$32.38-\$66.94  
↻ Solar Sales Representative | \$30.69-\$55.36  
Office Manager | \$11.19-\$16.80  
Technical Support Representative | \$11.94 | \$18.99



## DESIGN AND INSTALLATION

Architect | \$25.69-\$43.44  
Construction Manager | \$33.48-\$51.52  
Solar Systems Engineer | \$34.79-\$51.01  
Structural Engineer | \$34.79-\$51.01  
Electrician | \$23.13-\$34.49  
HVAC Technician | \$20.18-\$28.36  
Plumber | \$20.85-\$37.11  
Solar Installation Manager | \$24.97-\$36.88  
↻ Solar Heating and Cooling System Installer | N/A  
Solar Site Assessor | N/A



## RESEARCH, DEVELOPMENT, AND MANUFACTURING

Mechanical Engineer | \$29.69-\$44.80  
Chemist | \$26.18-\$43.23  
↻ Solar Production Manager | \$34.79-\$56.26  
↻ Solar Production Supervisor | \$20.61-\$31.55  
↻ Welder, Solderer, or Brazier | \$15.40-\$21.78  
↻ Cutting or Punching Machine Operator | \$12.92-\$18.41  
↻ Assembler | \$11.93-\$17.80



↻  
THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT

## WHAT IS SOLAR HEATING AND COOLING?

People have harnessed heat from the sun for ages. Today's solar heating and cooling (SHC) industry uses mechanical technology to capture heat from the sun and uses it to manage air or water temperature in a building.

Solar heating and cooling is commonly thought of as "active" technology, such as mechanized HVAC systems. But "passive" solar design is also a viable option, especially in cold climates. Passive solar design maximizes the energy that buildings receive from the sun in the form of heat and light, and minimizes the absorption of that same energy when it isn't needed (e.g., in the summer). Window placement, building materials, and other factors help to manage passive solar energy.

## MATERIAL QUALITY STANDARDS

In response to past concerns about the quality of solar collectors, a joint effort between the U.S. Department of Energy and several states, including Minnesota, established the Solar Rating and Certification Corporation (SRCC) in 1981. SRCC has developed testing and certification for both solar collectors and systems to ensure they meet minimum standards of quality and performance. SRCC certification is required in Minnesota by the Minnesota Building Code.

## EDUCATION AND TRAINING

A number of solar training programs exist in Minnesota, through technical and community colleges, universities, and apprenticeship programs. Consumer education and introductory workshops are also available through solar advocacy organizations for wide audiences.

There is a small but growing number of solar heating and cooling installers in Minnesota certified in solar thermal by the North American Board of Certified Energy Practitioners (NABCEP). This certification identifies the installer as someone with expertise in solar heating and cooling, and is a voluntary, competency-based certification.

## THE INDUSTRY IS EVOLVING

Because the industry is evolving, there are many opportunities to contribute to the solar heating and cooling industry that are not directly shown here. Solar-related occupations, along with training programs and certifications, will continue to be defined as the industry matures.

## LEARN MORE ABOUT SOLAR HEATING AND COOLING CAREERS

Click on a career title above to find job-specific details like job description, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the natural resource conservation career pathway tool at:

[www.iseek.org/industry/green/careers/careers-in-solar-heating-and-cooling.html](http://www.iseek.org/industry/green/careers/careers-in-solar-heating-and-cooling.html)

# SOLAR ELECTRIC | CAREERS

Wage data is from the Minnesota Department of Employment and Economic Development's Occupational Employment Survey. Wages updated to second quarter, 2011.

## ADMINISTRATIVE, SALES, AND MANAGEMENT

General Manager | \$31.64-\$65.67  
Marketing Manager | \$44.96-\$68.92  
Solar Sales Manager | \$32.38-\$66.94  
Solar Sales Representative | \$30.69-\$55.36  
Office Manager | \$11.19-\$16.80  
Technical Support Representative | \$11.84-\$18.99



## DESIGN AND INSTALLATION

Construction Manager | \$33.48-\$51.52  
Civil Engineer | \$30.13-\$47.94  
Structural Engineer | \$34.79-\$51.01  
Solar Systems Engineer | \$34.79-\$51.01  
Solar Electric Drafter | \$21.26-\$31.28  
Electrician | \$23.13-\$34.49  
Solar Electricity Installation Manager | \$24.97-\$36.88  
Solar Electricity Installer | N/A  
Surveyor | \$24.69-\$37.53  
Solar Site Assessor | N/A



## RESEARCH, DEVELOPMENT, AND MANUFACTURING

Chemist | \$26.18-\$43.23  
Electrical Engineer | \$33.21-\$48.11  
Mechanical Engineer | \$29.69-\$44.80  
Engineering Technician | \$21.20-\$31.84  
Photovoltaic Production Manager | \$34.79-\$56.26  
Photovoltaic Production Supervisor | \$20.61-\$31.55  
Cutting or Punching Machine Operator | \$12.92-\$18.41  
Welder, Solderer, or Brazier | \$15.40-\$21.78  
Assembler | \$11.93-\$17.80



THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT

## WHAT IS SOLAR ELECTRIC?

Solar electric (or photovoltaic) technology is perhaps the most widely-known form of captured solar energy. Photovoltaic panels directly convert sunlight into electricity. Solar electric panels can be found in large arrays in fields, and in smaller systems on the rooftops of homes and buildings, providing renewable electricity to millions of Americans.

Photovoltaic panels are not the only technology that converts sunlight into electricity. For instance, concentrated solar power, which uses large mirrors to concentrate sunlight, is also in use around the world. However, to date solar electricity in Minnesota comes from the more traditional photovoltaic technology that is reflected in the occupations highlighted here. As technologies advance, the mix of solar electric occupations in Minnesota may change as well.

## EDUCATION AND TRAINING

While solar electric technology itself has existed for over a hundred years, the industry is growing rapidly. Solar training programs exist throughout the state in colleges, universities, and apprenticeship programs. In addition, consumer education offerings can be found through nonprofit solar advocacy organizations. Many experienced solar installers are voluntarily certified by the North American Board of Certified Energy Practitioners (NABCEP), which identifies them as someone with expertise in solar and a commitment to a code of ethics.

## THE INDUSTRY IS EVOLVING

From material scientists developing special adhesives, to production engineers helping design manufacturing equipment, there are many opportunities to contribute to the solar electric industry that are not directly addressed here. Occupations in solar, along with education programs and professional certifications, are expected to become more defined as the industry continues to evolve and grow.

## LEARN MORE ABOUT SOLAR ELECTRIC CAREERS

Click on a career title above to find job-specific details like job description, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the natural resource conservation career pathway tool at:

[www.iseek.org/industry/green/careers/careers-in-solar-electric.html](http://www.iseek.org/industry/green/careers/careers-in-solar-electric.html)



# NATURAL RESOURCE | CONSERVATION CAREERS

Wage data is from the Minnesota Department of Employment and Economic Development's Occupational Employment Survey. Wages updated to first quarter, 2011.

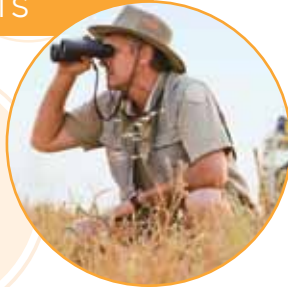
## TECHNICAL SERVICES

- Civil Engineer | \$30.05-\$43.83/hr.
- ↻ Civil Engineering Technician | \$23.66-\$31.08/hr.
- Landscape Architect | \$23.54-\$36.11/hr.
- Cartographer | \$23.28-\$32.84/hr.
- ↻ GIS/Mapping Technician | \$16.99-\$26.21/hr.



## FORESTERS & FIELD CONSERVATIONISTS

- Ecologist or Conservation Scientist | \$23.01-\$33.59/hr.
- Park Manager or Naturalist | \$23.01-\$33.59/hr.
- ↻ Conservation Technician | \$13.65-\$22.40/hr.
- ↻ Conservation Worker | \$9.43-\$16.71/hr.
- Forester | \$21.98-\$32.39/hr.
- ↻ Forestry Technician | \$13.65-\$22.40/hr.
- ↻ Forestry Worker | \$9.43-\$16.71/hr.



## OUTREACH

- Public Relations & Communications Manager | \$37.88-\$60.22/hr.
- ↻ Public Relations & Outreach Specialist | \$21.80-\$33.74/hr.
- Fundraising Manager | \$37.88-\$60.22/hr.
- ↻ Fundraiser | \$21.80-\$33.74/hr.
- ↻ Field or Phone Canvasser | \$15.14-\$28.75/hr.
- Conservation Methods Teacher | \$27,919-\$38,862/yr.



THIS SHOWS  
THE POSSIBILITY  
FOR CAREER  
ADVANCEMENT

## PROFESSIONAL SERVICES

- Executive Director | \$54.23->\$80.00/hr.
- ↻ Conservation Program Manager | \$31.50-\$65.39/hr.
- Financial Manager | \$40.89-\$66.42/hr.
- Conservation Real Estate Specialist | \$24.16-\$40.24/hr.
- Conservation Planner | \$22.41-\$33.57/hr.
- Volunteer Coordinator | \$12.74-\$18.69/hr.
- Permit Coordinator | \$16.42-\$22.89/hr.



## SOIL, WATER, AND BIOLOGICAL SCIENTISTS AND SPECIALISTS

- Hydrologist | \$28.38-\$35.92/hr.
- ↻ Water Resource Technician | \$16.70-\$25.77/hr.
- Soil or Plant Scientist | \$23.01-\$33.59/hr.
- Zoologists and Wildlife Biologists | \$20.78-\$31.38/hr.
- ↻ Biological Science Technician | \$15.68-\$30.00/hr.
- Nursery Manager | \$24.70-\$40.64/hr.
- ↻ Nursery Worker | \$9.42-\$12.87/hr.



## FIRE PROTECTION AND LAW ENFORCEMENT

- Forest Fire Supervisor | \$24.34-\$38.69/hr.
- ↻ Forest Fire Inspection and Prevention Specialist | \$12.98-\$24.73/hr.
- Forest Firefighter | \$11.13-\$21.65/hr.
- Forest and Wildlife Detective | \$26.77-\$37.05/hr.
- ↻ Fish and Game Warden | \$18.40-\$30.25/hr.

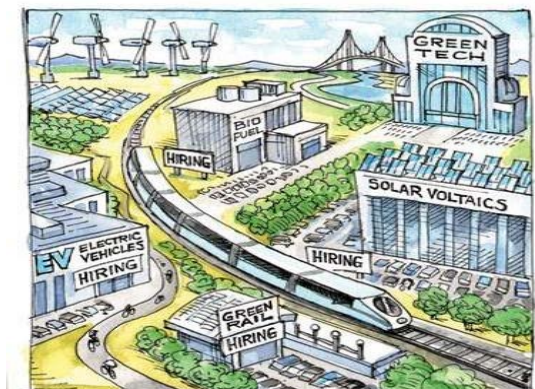


## LEARN MORE ABOUT NATURAL RESOURCE CONSERVATION CAREERS

Click on a career title above to find job-specific details like job description, work environment, and certifications. To compare careers by wages, training requirements, skills and knowledge needed, and more, visit the natural resource conservation career pathway tool at:

[www.iseek.org/industry/green/careers/careers-in-conservation.html](http://www.iseek.org/industry/green/careers/careers-in-conservation.html)

# Clean Energy Careers



## Workshop I: Why Should I Care?

### Important Vocabulary

**Clean energy:** Heat and electricity produced from renewable sources, generating little or no pollution or emissions. Most renewable energy comes from local sources, and they are sustainable over time rather than finite like traditional fossil fuels.

**Fossil Fuels:** Electricity or heat generated with oil, coal, natural gas or other combustible hydrocarbon for cooking, heating/cooling, transportation, manufacture and other uses. Many of the fuels used each day are derived from fossil fuels. Crude oil can be refined into gasoline (also known as petrol), diesel gasoline, kerosene, motor oil, lighter fluid and many other products. Natural gas also contains propane. Charcoal is not a fossil fuel (it's made from wood). Fossil fuels were formed from the organic remains of prehistoric plants and animals. They are non-renewable. Burning fossil fuels emits carbon dioxide (CO<sub>2</sub>).

**Renewable Energy:** Also known as clean energy. It is generally defined as energy that comes from resources which are continually replenished on a human timescale such as sunlight, wind, flowing water, tides, waves, geothermal heat and hydrogen. Biomass (organic matter such as wood, wood pellets) and biogas (such as ethanol and "organics to energy") is also often called a renewable energy.

**Energy uses:** Energy is primarily used for electricity and heat. These sources provide utility through providing lights, hot water/space heating, cooking, powering manufacturing, communications and entertainment, and transportation.

**Energy efficiency:** Using less energy to provide the same service. (Like using a CFL (Compact Florescent Light) bulb rather than an incandescent bulb.

**Energy conservation:** Using less energy. (Like programming a home thermostat to lower the temperature when no one is home.)

**Ecological Footprint :** A measure of human demand on the Earth's ecosystems. It represents the amount of biologically productive land and sea area necessary to supply the resources a human population consumes, and to break down the associated waste. Using this method it's possible to estimate how many planet Earths it would take to support humanity if everyone followed a given lifestyle.

**Carbon Footprint:** A measure of the total amount of carbon dioxide (CO<sub>2</sub>) and methane (CH<sub>4</sub>) emissions of a defined population, system or activity

**Biocapacity:** The capacity of an area of the Earth to provide resources and absorb wastes.

**Greenhouse effect:** The Earth gets energy from the sun in the form of sunlight. The Earth's surface absorbs some of this energy and heats up. The Earth cools down by giving off a different form of energy, called infrared radiation. But before all this radiation can escape to outer space, greenhouse gases in the atmosphere absorb some of it, which makes the atmosphere warmer, which also makes the Earth's surface warmer.

**Carbon Dioxide:** This is an odorless, colorless gas made of the common elements Carbon and Oxygen bonded together. When we burn fossil fuels we produce Carbon Dioxide. This is the most abundant heat trapping greenhouse gas. Carbon naturally moves from one part of the Earth to another through the carbon cycle. People are adding carbon to the atmosphere (in the form of CO<sub>2</sub>) faster than natural processes can remove it. As it increases in the atmosphere it causes climate change.

**Greenhouse Gases:** Gases that trap heat in the Earth's atmosphere. Most common are Carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide, and fluorinated gases (human-made gases that are used for refrigeration, air conditioning, fire extinguishers, etc. and that stay in the atmosphere for centuries.)

**Sustainable Development:** Socially inclusive and environmentally sustainable economic growth. This is both a way to understand the world and a method for solving global problems. The United Nations is working on a set of world-wide sustainable development goals.

#### **Interesting websites to learn more:**

A Students Guide to Climate Change: <http://www.epa.gov/climatestudents/basics/today/greenhouse-gases.html>

Young Voices for Climate Change: <http://www.youngvoicesonclimatechange.com/kids.php>

Massachusetts Clean Energy Center: <http://www.masscec.com/about-clean-energy>

Global Footprint Network: [http://www.footprintnetwork.org/en/index.php/GFN/page/at\\_a\\_glance/](http://www.footprintnetwork.org/en/index.php/GFN/page/at_a_glance/)

Global Footprint world map of ecological footprints: <http://storymaps.esri.com/globalfootprint/>

United Nations presentation on Sustainable

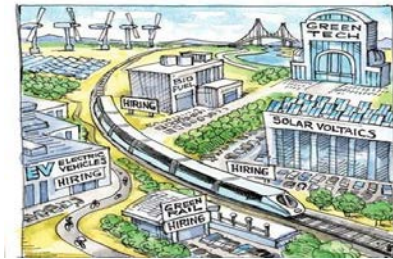
Development: [http://www.un.org/en/development/desa/policy/untaskteam\\_undf/presentation\\_untt\\_report.pdf](http://www.un.org/en/development/desa/policy/untaskteam_undf/presentation_untt_report.pdf)





# Clean Energy Careers

## Looking for Clean Energy Job Opportunities



### Here's what to do:

Search online job listings that specialize in green jobs to **find a clean energy job vacancy that interests you**. It's best if you find one in the Merrimack Valley, or at least in the Boston area. Fill in the worksheet below, and be ready to tell the group this job title and why it interests you.

### Where to look:

1. Mass Clean Energy Council Jobs Board <http://www.masscec.com/jobs>
2. Massachusetts Job Quest – Green Jobs <http://mass-green.jobs/>
3. Indeed.com – MA jobs in renewable energy <http://www.indeed.com/jobs?q=Renewable+Energy&l=Massachusetts>

### Vital Statistics:

#### Activities for Workshop 2:

Job Title: \_\_\_\_\_

Where you found it: \_\_\_\_\_

Why it interests you:

---

---

---

---

---

---

---

---

---

---

**Activities for Workshop 3:**

Complete the following for the job listing you found. Look up the job online again if you closed the website where it was found.

Education requirements: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Where could you get that education or training? Look for it in the MA Clean Energy Careers Training & Education Directory at <http://ma.cleanenergyeducation.org/>

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Can you figure out the personal effectiveness and workplace competencies required?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_



## Workshop 3: “Even Clean Energy Careers require an education!” Worksheet

### ARE YOU A PROFESSIONAL?

How you look, talk, write, act and work determines whether you are a professional or an amateur. Society does not emphasize the importance of professionalism, so people tend to believe that amateur work is normal. Many businesses accept less-than-good results.

***“Anything you do, do it as a Professional to Professional standards.***

***“Develop the frame of mind that whatever you do, you are doing it as a professional and move up to professional standards in it.***

***“So learn this as a first lesson about life. The only successful beings in any field, including living itself, are those who have a professional viewpoint and make themselves and ARE professionals” — L. Ron Hubbard***  
**Examples:**

#### A PROFESSIONAL:

- learns every aspect of the job. An amateur skips the learning process whenever possible.
- carefully discovers what is needed & wanted. An amateur assumes what others need and want.
- looks, speaks and dresses like a professional. An amateur is sloppy in appearance and speech.
- keeps his/her work area clean & orderly. An amateur has a messy, confused or dirty work area.
- is focused and clear-headed. An amateur is confused and distracted.
- does not let mistakes slide by. An amateur ignores or hides mistakes.
- jumps into difficult assignments. An amateur tries to get out of difficult work.
- completes projects asap. An amateur piles unfinished work on top of unfinished work.
- remains level-headed and optimistic. An amateur gets upset and assumes the worst.
- handles money and accounts very carefully. An amateur is sloppy with money or accounts.
- faces up to other people's upsets and problems. An amateur avoids others' problems.
- uses higher emotional tones: Enthusiasm, cheerfulness, interest, contentment. An amateur uses lower emotional tones: anger, hostility, resentment, fear, victim.
- persists until the objective is achieved. An amateur gives up at the first opportunity.
- produces more than expected. An amateur produces just enough to get by.
- produces a high-quality product or service. An amateur does medium-to-low quality work.
- earns high pay. An amateur earns low pay and feels it's unfair.
- has a promising future. An amateur has an uncertain future.
- **The first step to making yourself a professional is to decide you ARE a professional.**



**Chose from the following role plays to act out how a professional handles situations at work:**

**Role Play Ideas:**

1. You are waiting for the bus to go to an interview, but it is already 10 minutes late and you still don't see it. If it does not get here in the next five minutes, you will be late for your interview.
2. One of your supervisors at Stop & Shop is always giving you the worst jobs — cleaning up spills, getting the carts when it is raining — and you are tired of it. You decide to talk to your supervisor about it.
3. You have been doing a great job at work. You just earned a \$.50/hour raise and you also have some new responsibilities, but you are not sure how to do one of the new tasks. You don't want to lose your raise.
4. You are working at the ticket counter of a movie theater. Someone comes over to you to complain about the dirty bathroom.
5. Your new boss asks for your e-mail address so she can send you the weekly employee announcements; the only e-mail address you have is: [uknowuwantme@gmail.com](mailto:uknowuwantme@gmail.com)
6. Your drawer is \$20 short at the end of your shift and you have no idea why.
7. Three of your friends ask you to buy them some sneakers with your employee discount at your new job; they all wear different size shoes.
8. You are working at Dunkin' Donuts when one of your customers comes back and complains that you messed up their order. They demand their money back.
9. Two weeks ago you told your supervisor that you were going to be away this upcoming weekend. You just checked this week's schedule and you are scheduled for Friday afternoon and Sunday morning.
10. You had a great interview for a summer job that you really want. You thought it went really well, especially because they called your references who told you they spoke very highly of you. However, it has been a week and you have not heard back about the job. You decide to call to check in about your application. You speak to the person who interviewed you and he tells you that they hired someone else for the position. You are disappointed because you really thought you were going to get the job. You ask him if he could tell you why. He tells you that he is not supposed to, but since he liked you when you came in, he will tell you. He explains that his supervisor called you to let you know that you had the job, but when she heard your cell phone message, she changed her mind.

*From "Empower Your Future" Commonwealth Corporation job readiness curriculum*