

Career *currents*

Exploring Today's Energy Careers with the NEED Project

Vol. 1, No. 2 Dec. 2005

Want a Cool Career? Check Out HVACR!

Heating and air conditioning systems control the temperature, humidity, and total air quality in residential, commercial and industrial buildings. The **mechanics** and **installers** who work on heating, ventilation, air conditioning and refrigeration systems are referred to as **HVACR technicians**.

A Career that Makes a Difference

If you are concerned about energy conservation and want to help home and business owners improve their energy efficiency with new system installations or keep existing systems operating at peak performance, then a career as an HVACR technician may be right for you.

Working Conditions

Technicians work in homes, stores, hospitals, office buildings, and factories - anywhere there is climate-control equipment. They may be assigned to specific jobsites at the beginning of each day or dispatched to service calls as needed. Technicians work outside in any weather, inside buildings with uncomfortable temperatures, in awkward or cramped positions, and even sometimes in high places.

The majority of mechanics and installers work 40 hours per week. During peak seasons they often work overtime. Some **maintenance workers** work evenings, weekends or "on call."

Education and Training

Because of the increasing sophistication of HVACR systems, employers prefer to hire people with technical school or apprenticeship training. Technical and trade schools, junior and community colleges, and the U.S. Armed Forces offer 6-month to 2-year programs in heating, air conditioning, and refrigeration.

Apprenticeship programs normally last 3-5 years and combine on-the-job training with classroom instruction. Classes include the use and care of tools, safety practices, blueprint reading, and the theory and design of heating, ventilation, air conditioning and refrigeration systems. Applicants for these

Photo credit: Bureau of Labor Statistics



About 249,000 mechanics and installers work with heating, ventilation, air conditioning and refrigeration systems, with a median hourly wage of \$16.78. Employer-sponsored benefits often include health insurance, pension plans, work-related training, uniforms, company vans and tools.

programs must have a high school diploma. Math and reading skills are essential.

Courses in physics, chemistry, electronics, mechanical drawing, blueprint reading and shop math provide a good background for students interested in entering this occupation.

Summarized from the Bureau of Labor Statistics' Occupational Outlook Handbook, www.bls.gov.

In This Issue

Green Building	2
What's New	3
Classifieds	3
Energy Career Chat.....	4-5
Resources	5
Career Challenge – Home Energy Audit	6
Teacher Guide	7
Crossword Puzzle	Back

The goal of this newsletter is to provide educators and students with resources that introduce energy careers. Each issue of *Career Currents* will focus on a different segment of the energy industry. No single issue is meant to be all-inclusive to either the industry segment profiled or all careers in energy. This issue focuses on careers in Energy Management.

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NEED welcomes your questions, comments, and suggestions. Please contact info@need.org.

Green Building

According to the Environmental Protection Agency (EPA), buildings in the United States account for:

- 39% of total energy use,
- 12% of total water consumption,
- 68% of total electricity consumption, and
- 38% of carbon dioxide emissions.

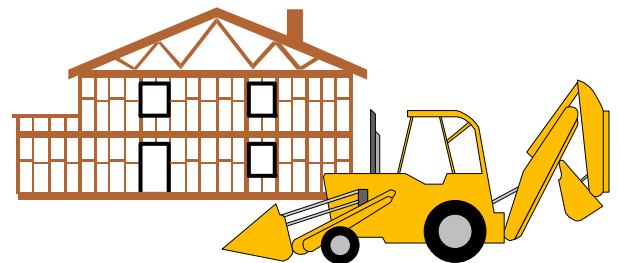
The buildings in which we live, work, and play protect us from nature's extremes, yet they also affect our health and environment. The design, construction, operation, maintenance, and removal of buildings take enormous amounts of energy, water, and materials; generate large quantities of waste, air and water pollution; and create storm water runoff and heat islands. Buildings develop their own indoor environments, which present an array of health challenges. Where and how they are built affect wildlife habitats and the hydrologic cycle.

As the environmental impact of buildings becomes more apparent, a new field called **green building** is gaining momentum. Green, or sustainable building, is the practice of creating healthier and more resource-efficient models of construction, renovation, operation, maintenance and demolition. Research and experience increasingly demonstrate that when buildings are designed and operated with their lifecycle impacts in mind, they can provide great environmental, economic, and social benefits. Elements of green building include energy efficiency and renewable energy, water stewardship, environmentally preferable building materials, waste reduction, indoor environment, and smart growth and sustainable development.

Green Schools

More than 53 million children and almost three million adults spend a significant amount of time in public and private school buildings that often contain environmental conditions that inhibit learning and pose increased health risks to children and staff. The EPA's Healthy School Environments website, www.epa.gov/schools, serves as a gateway to online resources that help **facility managers, school administrators, architects, design engineers, school nurses, parents, teachers** and **staff** address environmental issues in schools.

Information from the EPA's Green Building website, www.epa.gov/opptintr/greenbuilding.



For the Record

In the Energy Career Chat with Sally Safety (October), we incorrectly stated that an air tugger is the basket workers use to board an oil rig. It is actually called a Personnel Basket or a Billy Pugh. A crane operator attaches the basket to a crane in order to haul people onto the rig. An air tugger is a winch, in use on the drill floor. Our thanks to Sandra Mourtou, Executive Director of the Offshore Energy Center in Houston, Texas, for catching our mistake. The revised October 2005 newsletter is available at www.need.org.

What's New in Energy Management?

According to *Newsweek Magazine* (November 21, 2005), home energy consumption is expected to rise more than 20 percent by 2025. Using energy efficient products in your home will help control high energy bills. Watch for these emerging technologies:

Roofs Heat absorbed by a roof can add 11 percent to home cooling costs. Shingles with special coatings will help reflect the sun's heat energy.

Windows "Smart windows" under development become less transparent on sunny days, blocking heat rays and reducing cooling bills up to 30 percent.

Ducts Today's duct work can leak 20 percent of the heating and cooling energy they carry. Researchers are developing ducts that snap together without fasteners or sealants, eliminating 90 percent of leaks.

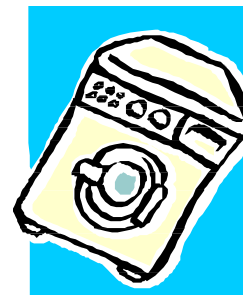
Air conditioners New industrial units use a desiccant (a drying agent) to dehumidify air, making the compressors' job easier. This energy-saving addition could be significant for homes in humid climates.

Meters Home meters directly linked to utility companies will automatically turn down appliances during peak hours, saving money and energy.

Refrigerators Thicker doors offer better insulation. Sensor-based defrosting turns on only when needed. New fans use energy-saving, low-heat electric motors.

Lights Semiconductor-based light emitting diodes (LEDs) are five times more efficient than incandescent bulbs and last 15 times longer. Researchers are developing brighter LEDs for common household use.

Water Heaters Heat pumps draw warmth from surrounding areas to heat water, more than doubling efficiency. Tankless units save natural gas by heating water only when needed.



Washers Front loading washing machines use 67 percent less water and 55 percent less energy than conventional washers. They also remove more water from clothes, cutting drying time.

Fuel Cells Although they efficiently produce electricity, fuel cells generate a lot of heat. New units use excess heat to make hot water. Currently, fuel cells are too expensive for use in most homes.

Energy Management Classifieds

Certified Energy Analyst

Building Energy Efficiency Standards are the guidelines used by design and construction industries to save billions of dollars in energy costs. Energy analysts are key to achieving these savings. Energy analysts: perform energy calculations and prepare compliance documentation for the energy code; possess an interest in the rapidly deregulating \$300 billion U.S. energy industry; develop an understanding of the electric and natural gas industry; enter and maintain client energy usage and cost information; create databases to track and forecast client energy usage; develop client energy budgets and variance analyses; prepare monthly energy reports for clients; and monitor utility tariffs (taxes) and rate changes.

To become a Certified Energy Analyst, you must demonstrate at least one year of experience performing energy compliance calculations, attend yearly continuing education training and pass the appropriate (residential/nonresidential) standards exam.

Energy Engineer

Work with various software programs to perform building simulation analyses for new construction projects. Provide technical assistance to owners, developers and contractors assisting with energy efficiency project identification and technology decisions associated with facilitating energy efficiency upgrades and improvements.

Candidates must have three or more years of experience working in the energy efficiency industry. Building simulation experience preferred. Candidates need background in: HVAC, lighting, controls, building envelope or related fields. Engineering or Architectural college degree required, technical degree preferred.

Energy Conservation Engineer

Bachelor's Degree in Engineering Technologies or Facility Engineer required. Assess problems and situations, develop recommendations and implement solutions, including economic justifications. Work effectively with customers, vendors, suppliers and contractors. Possess strong verbal and written communication skills to present findings and ideas in a clear manner; negotiate and persuade effectively. Minimum five years experience conducting energy and power studies required.

Energy Career Chat with Wayne Chase

One fast growing field is Energy Management, in which engineers and other professionals work with facilities to increase energy efficiency and conservation practices. Wayne Chase is a **Certified Energy Manager** who works for Chevron Energy Solutions in Syracuse, New York.

ENERGY SMARTS: Tell us what you do.

WAYNE CHASE: I'm a Regional Accounts Manager for Chevron Energy Solutions. I'm responsible for monitoring and verifying energy performance contracts all over the northeast. (In energy performance contracting, an engineering company makes improvements to the customer's facility to save energy and then provides a guarantee that a certain amount of savings will be realized.)

ES: I understand that your work is usually referred to as "energy monitoring." What does that mean?

WC: That means we have customers that have contracted with us to lower their energy use. We change out their lighting so they have lights that use less electricity, put in new HVAC (heating, ventilation and air conditioning) systems, and install windows and insulation. We also do water conservation.

ES: Why are clients concerned about how much energy they use?

WC: Our clients pay a lot of money for their electricity, natural gas and water, and their utility budgets tend to be a large part of their expenditures. Their highest budget item is usually salaries for the people who work in the building. Often, the second or third highest is their energy and water use. So, if we help them reduce these large dollar amounts, even if we only reduce it a little bit percentage-wise, it's still a percentage of a very large number, so they end up saving quite a few dollars at the end of the year.

ES: Do you ever visit clients and see how they are using energy? If so, what are you looking for?

WC: Yes, we're looking to make sure that the equipment we installed is working properly and doing what it's supposed to do - save them energy or water. We're also looking at how the people in the building are operating the equipment. We check to make sure it's being used the way we predicted, because we told our clients how much energy savings they would have based on those predictions.

ES: When you are looking at a building's energy use, do you use any kind of special equipment?

WC: I'll often bring metering equipment - devices that measure how much energy the lights are using, or water meters that measure the flow of water through faucets or toilets.



As a Certified Energy Manager, Wayne Chase conducts building audits to find ways to reduce client energy usage.

ES: How do these meters work? Is there any kind of interface that allows you to use this information on a computer?

WC: The electric meter I use is handheld, and has the ability to measure electricity use. I use it mainly for lights and motors to measure how much energy they draw in watts and kilowatts; we have other devices that measure their run-time. Using those two parameters, we can determine how much electricity they use over a year. I graph the data so that I have a picture of how that equipment is really being used.

ES: What kind of schooling did you need in order to do this job? Do you have any special degrees or certifications?

WC: I have an electrical engineering degree, and it is recommended that all of our staff members have one. Most of them are also "**Professional Engineers**," meaning they have passed their state license exams. There are also several certification programs you can take through the Association of Energy Engineers and also state programs. You want to keep your training up to date and also want to be able to show people that you have a certain level of knowledge about the things you're working on.

ES: When you were growing up, what kinds of things did you like to do?

WC: I was pretty good at science and math. My favorite things were the hands-on sciences, like Earth Science, Biology, and Physics, where you got to do experiments and see results and play with really neat equipment. Math came pretty easily to me, and I really liked computers. I've used computers since I was a little kid - programming them, playing games. I'm still a computer nut - I build computers for fun.



Wayne Chase uses a computer to graph data and analyze client energy consumption.

ES: How did you get interested in energy?

WC: At the end of college, I worked for a utility company. They were running energy conservation programs for their customers, so I got involved with that side of their customer service, and it was fun. There was always something new and different coming out. It felt good to help customers save money. They were happy, and at the same time it was good for the environment. Saving energy is always good for the environment because it means we're reducing the number of power plants we need to keep everyone's electricity flowing.

ES: If you were going to give advice to someone who wanted to follow a career path such as yours, what would it be?

WC: My advice is to get good grades in high school and go to the college of your choice. You don't necessarily need to go to an engineering school but, if you do, you'll have more opportunities.

ES: Is there anything else you'd like to add?

WC: I really feel good about what I do because of the advantages it has for our customers. The clients save money and receive new equipment. Everybody likes getting new lights, new heating systems or new air conditioning systems. So my customers are happy, and I feel good that my career has a beneficial impact on the world.

This interview is reprinted with permission from NYSERDA's Energy Smart Students Program.

Will your students participate in a Career Fair or Take Your Child to Work Day? If so, we want to hear from them! Career Currents is accepting student written interviews and articles featuring careers in energy industries. Submit student work to info@need.org, or The NEED Project, P.O. Box 10101, Manassas, VA 20108.

Energy Career Resources

- Bureau of Labor Statistics – www.bls.gov.
- The JETS' website, www.jets.org, includes resources, articles, and activities about engineering and technology careers. JETS' November 2005 newsletter has several good articles on **HVACR Engineering**.
- Wisconsin K-12 Energy Education Program's (KEEP) website provides information on energy careers - www.uwsp.edu/cnr/wcee/keep.
- U.S. Department of Energy's link to Careers in Renewable Energy - eereweb.ee.doe.gov/education/careers_renewable_energy.html.
- Visit www.GreenerBuildings.com for information and resources on environmental issues related to buildings and facilities. GreenerBuildings.com is a partnership between the U.S. Green Building Council - www.usgbc.org and the National Environmental Education & Training Foundation - www.GreenBiz.com.
- The Federal Energy Management Program helps agencies save energy, helps taxpayers save dollars, and demonstrates leadership with responsible, cleaner energy choices - www.eere.energy.gov/femp.
- Interstate Renewable Energy Council - www.irecusa.org.
- Sustainable Buildings Industry Council - www.SBICouncil.org.
- Energy Star Program - www.energystar.gov.
- American Society of Heating, Refrigeration and Air Conditioning Engineers – www.ASHRAE.org.

Interactive Energy Consumption Calculators:

- Discover your impact on the environment using BP's Household Carbon Footprint calculator - www.bp.com/carbonreduction.
- At www.energyguide.com, enter information about your home and energy bills for a customized home energy analysis.
- Electricity, measured in kilowatt-hours, can be difficult to understand. This calculator converts kilowatt-hours to measures of energy use easy to visualize - www.wattsonschoools.com/calculator.htm.

Answers to the Energy Management Crossword Puzzle on Page 8:
1. weatherization, 2. thermostat, 3. CFL, 4. EnergyStar, 5. lumen, 6. landscaping, 7. career, 8. kilowatt, 9. insulation, 10. HVACR, 11. daylighting, 12. green.

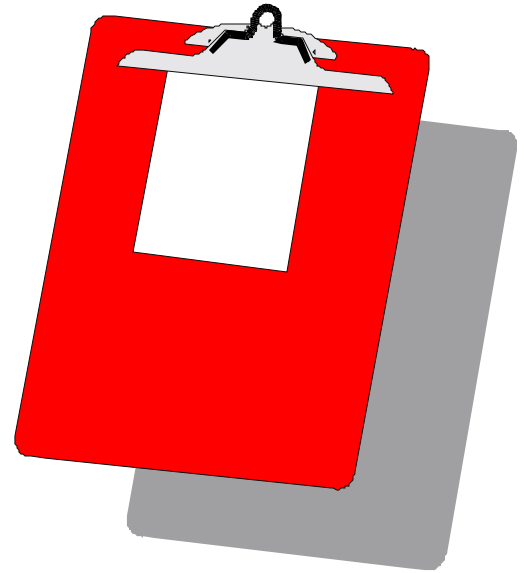
Career Challenge – Be A Home Energy Auditor

Energy Consumption

1. List the energy consuming devices in your kitchen.
2. List the energy consuming devices in your bathroom.

Heating and Cooling

1. Thermostat settings:
Cooling Season: Day _____ °F Night _____ °F
Heating Season: Day _____ °F Night _____ °F
2. Are there any heat-emitting devices located near the thermostat? _____
3. Does your home have a programmable thermostat? _____
4. How is your home heated (natural gas/electricity/propane/wood-burning stove)?
5. How is your home cooled (central air conditioner/window air conditioner/fans)?
6. Number of times per year the furnace filter is changed. _____
7. Does your family use blinds and drapes to help control temperature in your home? _____
8. Does your home have storm windows and doors? _____



Lighting

1. Number of incandescent lightbulbs in your home. _____
2. Number of compact fluorescent lightbulbs in your home. _____

Water Heating and Use

1. Number of times your dishwasher is run per week. _____
2. How often the energy saving feature on the dishwasher is used. 0% 25% 50% 75% 100%
3. Number of loads of laundry washed at home per week. _____
4. Percentage of the laundry loads washed in cold water. 0% 25% 50% 75% 100%
5. Total number of baths taken by all family members each week. _____
6. Total number of showers taken by all family members each week. _____
7. Average length of each shower. _____ minutes
8. Is your water heater wrapped with an insulation blanket? _____

Connections and Reflections

1. Describe two things your family does to save energy at home.
2. Describe one way your family could reduce electricity consumption at home and how you might get everyone in your family to participate.
3. What are two ways to be comfortable at home without adjusting the temperature and using more energy?
4. What can your family do to reduce your hot water use?
5. If you could change one thing about the way you use energy, what would it be and why?

Teacher Guide for using *Career Currents*

BACKGROUND

Teachers and members of the energy industry recognize a need for comprehensive energy career information aimed at middle school and high school students. Each issue of *Career Currents* will focus on careers in a specific segment of the energy industry.

GOALS

- To present students with a broad spectrum of energy careers and corresponding occupations so that students are informed about employment options they have for their future.
- To profile occupations with a wide range of educational requirements and salaries.
- To help students realize that the careers they want to pursue several years from now will be affected by their current skills and attitudes about science and math.
- To show the application of energy knowledge in “non-traditional” career paths (e.g. accounting, mathematics, law).

NATIONAL SCIENCE STANDARDS

Content Standard G: History and Nature of Science, Science as a Human Endeavor

- Many people choose science as a career and devote their entire lives to studying it. Many people derive great pleasure from doing science. (K-4)
- Women and men of various social and ethnic backgrounds - and with diverse interests, talents, qualities, and motivations - engage in the activities of science, engineering, and related fields such as the health profession. Some scientists work in teams, and some work alone, but all communicate extensively with others. (5-8)
- Individuals and teams have contributed and will continue to contribute to the scientific enterprise. Doing science or engineering can be as simple as an individual conducting field studies or as complex as hundreds of people working on a major scientific question or technological problem. Pursuing science as a career or as a hobby can be both fascinating and intellectually rewarding. (9-12)

EXTENSION IDEAS

- Survey students at the beginning and end of the school year, ranking the following questions. Compare rankings to analyze how students’ attitudes and perceptions change over the year.
 1. What are your top three career choices?
 2. How important is your knowledge of science to your career choices?
 3. How important is getting an education to your career choices?
 4. When do you think you should begin preparing for your future career?
- Have students brainstorm a list of energy careers at the beginning and end of the year. Compare the variety/quantity of answers.
- Using the interview model on Pages 4-5, divide students into teams of two. Each team chooses an energy career to research, and presents the results of its research with a mock interview between the two team members. As the energy professional being interviewed, the student might want to use props related to his/her career. Use these questions as a guide.
 1. What is your energy career? Describe your typical work day.
 2. What kind of education do you need in this job? Do you have any special degrees or certifications?
 3. What are your working conditions like? Do you work in an office or out in the field?
 4. Where are most people in this career employed?
 5. What is the average salary for this career?
- Have students research and report on aspects of green buildings, such as those listed on Page 2.
- Have each student choose a household appliance, such as those on Page 3. Interview someone who works with the appliance, such as a technician or salesperson, to learn about new technologies that make the new appliance more energy efficient than older models.
- Challenge students to identify people with careers in energy management in your community; invite them to speak to your class.
- Practice job interviewing skills. To model the actual interview process, invite industry professionals to “interview” students for potential employment with their companies.

Energy Management Crossword Puzzle

You may need to do some research to complete the puzzle. Answers are on Page 5.

ACROSS

1. To make a house better protected against the effects of weather.
4. Label identifying energy efficient appliances.
5. A measure of light intensity.
9. Material used to separate surfaces to prevent the transfer of electricity, heat or sound.
11. Using windows and natural sunlight instead of electric lighting.

DOWN

2. A device that controls the amount of heating and cooling produced and/or distributed.
3. Uses less energy than an incandescent bulb.
6. Use of plants to modify or ornament a natural landscape.
7. Occupation.
8. Unit of power used to measure electric power or consumption.
10. Heating, Ventilation, Air Conditioning, Refrigeration
12. Type of buildings that create healthy and resource-efficient construction, renovation, operation, maintenance, and demolition.

