

A graphic with a dark background. On the left, there is a stylized sun with rays. To the right, the words "SOLAR ENERGY" are written in large, 3D, yellow block letters. Below this, the text "Photovoltaic & other solar options for the home" is written in white. At the bottom, "Carteret-Craven Electric Cooperative" is written in yellow. In the bottom left corner, the website "www.carteretcravenelectric.coop" is listed. In the bottom right corner, there is a logo for Touchstone Energy with the text "Your Touchstone Energy® Partner" and "The power of human connections."

SOLAR ENERGY

Photovoltaic & other solar options for the home

Carteret-Craven Electric Cooperative

www.carteretcravenelectric.coop

Your Touchstone Energy® Partner
The power of human connections.

Photovoltaic & passive solar options for the home

First things first

- Energy efficiency produces more financial and environmental benefit per dollar spent
- Reduce overall energy usage
- Install energy-efficient appliances
- Have proper insulation and sealing
- Ensure heating, cooling systems okay

www.constructionline.com

Yale Television Energy Efficient
The power of green construction

Energy efficiency produces more financial and environmental benefit per dollar spent than does PV.

To maximize the benefits of a photovoltaic system, you must first reduce overall energy usage in a home.

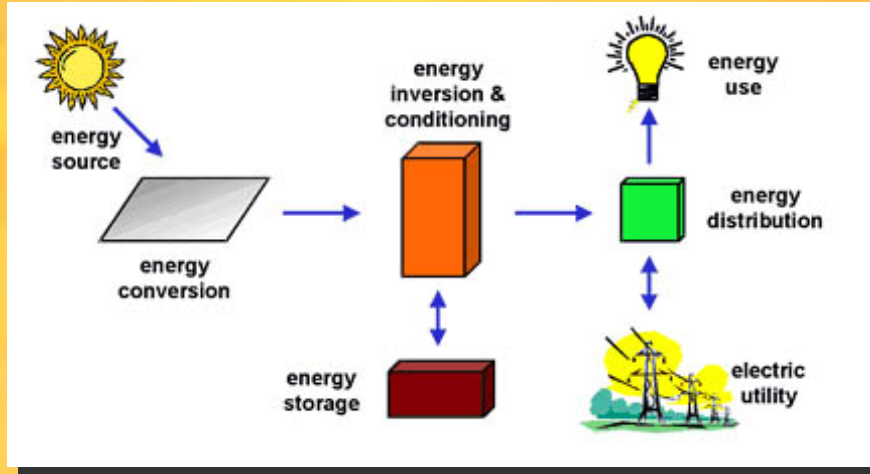
Installing energy-efficient appliances, insulating and sealing the home properly, and ensuring the HVAC system is properly installed are all important first steps when considering photovoltaic systems as a home feature.

Photovoltaics

- Photovoltaics: converting light to electricity
- Silicon, semi-conducting material (solar cell) transforms light into direct current
- Power transformed by inverter into alternating current for use
- Works with existing electrical supply

Solar cells – the basic building blocks of a PV system—consist of semiconductor materials. When sunlight is absorbed by these materials, the solar energy knocks electrons loose from their atoms. This phenomenon is called the "photoelectric effect." These free electrons then travel into a circuit built into the solar cell to form electrical current.

Photovoltaics



Practical Matters

- Photovoltaic cells only produce electricity when sun is shining
- PV system needs clear access to sun rays most of the day, year around
- Work best when the sun rays are perpendicular to the panels
- Heat increases resistance to flow of electricity; cool, sunny days are ideal

www.conwest.com/energy.htm

Yale Technology Energy Center
The Center for Sustainable Energy

Photovoltaic cells only produce electricity when sun is shining.

PV system needs clear access sun rays most of the day, year around.

Heat actually increases the resistance to the flow of electricity, which suggests that the ideal climate is one with a lot of sunshine and low temperatures. PV modules are primarily made of silicon, and like silicon computer chips they operate most efficiently when they're cool. Heat causes electrical resistance in a silicon chip or PV module, which slows productivity.

Practical Matters

- Operate with little maintenance
- Solar cells are currently costly; require a large initial capital investment
- North Carolina offers tax credit of 35%
- Federal tax credit expired Dec. 31, 2007

www.dsireusa.org

Yale Technology Energy Project
The Center for Sustainable Energy

Solar panels do operate with little maintenance, but they are currently costly and require a large initial capital investment. Right now, there is a shortage of polysilicon, a key ingredient in the manufacture of solar sales.

The **break-even point** for a system **depends on financing and incentives**, which vary from place to place, and it depends on your **solar resources** and what you would pay for another source of energy. As technology improves and as demand increases, initial costs should go down and efficiency should rise.

Be wary of payback claims. Do careful research before you take on any alternative energy project.

North Carolina offers a tax credit of 35% of the cost of renewable energy property constructed, purchased or leased by a taxpayer and placed into service in North Carolina during the taxable year. The credit is subject to various ceilings depending on the type of renewable energy system.

The federal Energy Bill passed in late 2007 did not renew the tax credit for renewable energy and energy efficiency measures.

Details of state tax incentives can be obtained from www.dsireusa.org/.

Interconnection

- Excess energy produced can be put back on the grid
- Requires interconnect agreement
- CCEC pays “avoided” costs ~ 2c/kWh
- NC GreenPower will also buy energy from small solar installations

www.ccecelectric.com

Yale TELEPHONE ENERGY PARTNER
The power of natural connections

Once converted to the appropriate voltage and frequency, the electricity from a PV system is suitable for the electric grid.

CCEC has developed an interconnect agreement that covers the technical and practical aspects of connecting a solar generator to the grid. The co-op pays “avoided” costs of about 2-cents per kilowatt hour. That method prevents cooperative members from subsidizing individual interconnected projects.

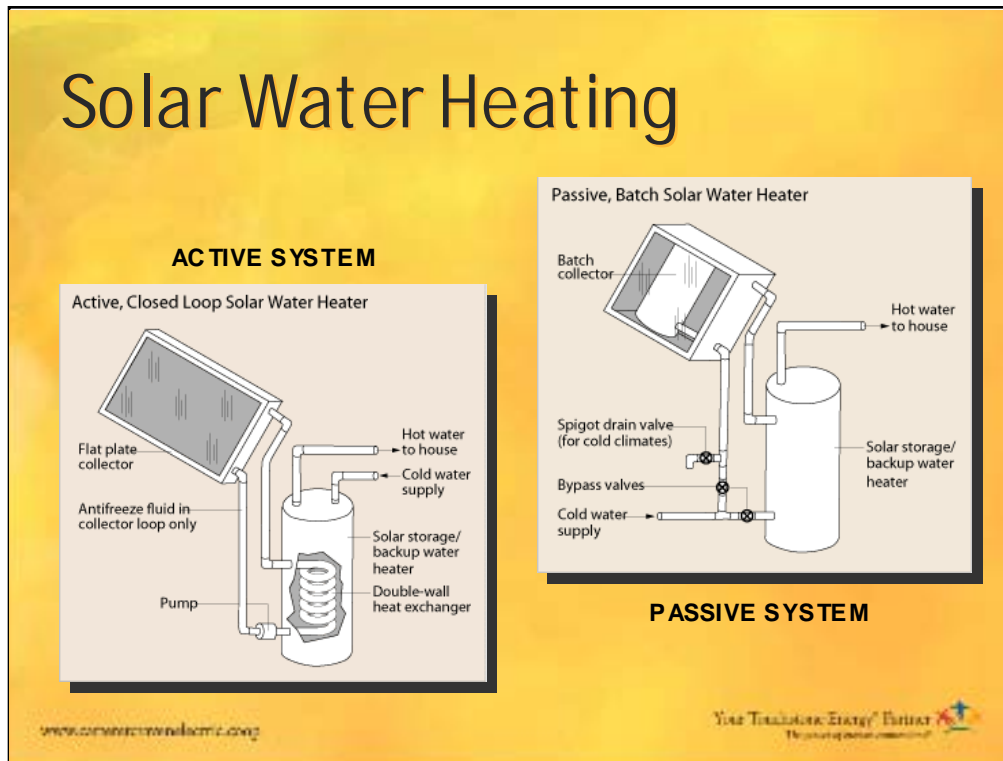
NC GreenPower will buy back energy from small solar installations of 10 kW or less capacity. These installations are permitted to enter an expedited generation contract. Interconnection must be completed and a power purchase agreement obtained prior to the producer being eligible to provide generation for the program and receive payments for power added to the grid.

Solar Water Heating

Solar collectors heat water

- System includes insulated storage tank and solar collector
- Two systems
 - *Active: has circulating pumps & controls*
 - *Passive: no pumps or controls*
- Passive solar less expensive, but usually less efficient

Solar Water Heating



Solar water heating systems include storage tanks and solar collectors. There are two types of solar water heating systems: active, which have circulating pumps and controls, and passive, which don't.

It is both ecological and can save money: usually a 40-50% reduction in fossil fuels burned. The investment return is usually 4 to 6 years, depending on the system cost & type of back-up water heating used.

Most solar water heaters require a well-insulated storage tank. Solar storage tanks have an additional outlet and inlet connected to and from the collector. In two-tank systems, the solar water heater preheats water before it enters the conventional water heater. In one-tank systems, the back-up heater is combined with the solar storage in one tank.

Three types of solar collectors are used for residential applications:

Flat-plate collector

Glazed flat-plate collectors are insulated, weatherproofed boxes that contain a dark absorber plate under one or more glass or plastic (polymer) covers. Unglazed flat-plate collectors—typically used for [solar pool heating](#)—have a dark absorber plate, made of metal or polymer, without a cover or enclosure.

Integral collector-storage systems

Also known as ICS or *batch* systems, they feature one or more black tanks or tubes in an insulated, glazed box. Cold water first passes through the solar collector, which preheats the water. The water then continues on to the conventional backup water heater, providing a reliable source of hot water. They should be installed only in mild-freeze climates because the outdoor pipes could freeze in severe, cold weather.

Solar Water Heating

- In North Carolina solar thermal technology is mostly used for hot water.
- Can meet 60% of hot water needs with one collector
- Payback is typically 4 to 10 years

www.conserve-energy.com

Yale University Energy Efficient
The Center for Energy-Efficient Buildings

In North Carolina solar thermal technology is mostly used for hot water. It is possible to meet 60% of your hot water needs with just one collector. The energy you save from not heating that water with electricity can pay back the cost of the system in 4-10 years.



Questions?