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## Governor's Office of Energy Management & Conservation

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## Solar System Maintenance

# Colorado

### Solar System Maintenance



Office of Energy Management and Conservation

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### ***Be proud of your system. It helps the environment.***



About 3 percent of the 900,000 single-family residences in Colorado have solar heating systems. Their contribution to Colorado's-domestic water heating -requirements is approximately 21\$ billion Btus (63 million kWh) annually. Approximately 65 percent of the solar systems pre-heat for natural gas heaters, saving approximately one billion cubic feet of natural gas. The remaining 45 percent of the-systems pre-heat for electric heaters, conserving about 28 million kWh of electricity.

This electricity savings corresponds to about 14 million kilograms (30 million pounds) of coal conserved and 180,000 kilograms (400,000 pounds) of sulfur dioxide prevented from release into the atmosphere. Electricity and gas savings combined prevent the release of 60 million kilograms (131 million pounds) of carbon dioxide into the atmosphere annually.

Proper maintenance of solar-systems throughout the state will help keep Colorado's investment in this clean energy source strong.

### ***Solar systems work for the environment.***

The Colorado Office of Energy Management and Conservation (OEMC) has completed inspections of 185 solar heating systems in

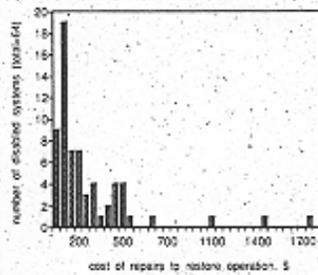


Figure 1

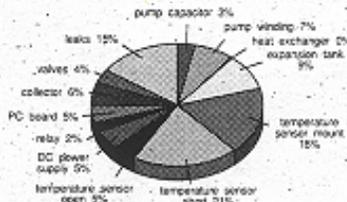
Colorado. The survey revealed some good news and some bad news for owners of the estimated 37,000 solar systems in Colorado.

The bad news is that only 65 percent of the systems were operational. The good news is that half the disabled systems could be repaired for less than \$150 each. As seen in Figure 1, 14 percent of the systems could be repaired for less than \$50, which is about the minimum cost of a repair call. Many of these small problems can be fixed by the owner at no cost.

Instruments attached to 15 of the surveyed systems indicate that a typical small solar system with 64 sq. feet of collector area (two 4' x 8' panels) used only for water heating would save 3,400 kWh of electricity -- or about \$240 per year at 7 cents per kWh. With a natural gas back-up heater, the 64 sq. feet solar system should save about 18,300 cubic feet of natural gas, for a savings of about \$75 per year at 40 cents per hundred cubic feet. Larger solar systems or systems with space heating will provide more savings. However, if the system is not operating, no money will be saved on utility-bills and the investment in the solar system will be lost.

**Your system may be working fine.**

The first step is to determine if your system is working. In a recent survey in Florida, 75 percent of the people with inoperative systems thought their systems were working. Check your solar system every month to make sure it is working. There are some simple problems you could fix yourself before calling a contractor. As seen in Figure 2, 44 of the problems were with temperature sensors. Problems with wiring or mounting of temperature sensors can often be corrected by the owner.



The pump should be running after the sun has been shining on the collectors for about an hour. If the pump is not running on a sunny day, check the following:

- ✓ The solar hot water storage tank may already be up to its temperature limit (around 180°F). If so, it's okay that the pump is off.
- ✓ Be sure the pump is plugged in and the controller is turned on. If they aren't, think before restoring power to the pump. Is there fluid in the system? Is there a pipe leak that required the system be turned off? If so, deal with those problems before turning the system back on.
- ✓ Are the narrow wires from the collector temperature sensor disconnected from the controller? Are they broken between the collector and the controller? If so, reconnect them or repair the break.
- ✓ Is the collector temperature sensor mounted firmly against the collector absorber plate or the pipe exiting the collector? Is it covered with insulation as it should be?
- ✓ Has the insulation on the sensor wires running to the storage tank melted or scraped off, creating a short circuit? If so, separate the wires and rewrap them with electrical tape.



**Short-circuited collector temperature sensors cause the pump to run all night. Short-circuited storage tank temperature sensors cause the pump not to run.**

The pump should not be running at night. If it is, check the following:



**Open-circuited collector temperature sensors keep the pump from turning on during the day. Open-circuited storage tank temperature sensors keep the pump running all night.**

### ENERGY HOTLINE

The Colorado Office of Energy Management and Conservation (OEMC) offers a toll-free consumer hotline as part of its education services. Consumers may phone (303)620-4284 in metro Denver or 1-800-632-6662 elsewhere in the state for information on a wide variety of energy topics. Follow-up materials are frequently provided.

OEMC was established in 1977 to serve the citizens of Colorado. Its mission includes promoting energy efficiency and contributing to the economic growth of Colorado through education, technical and financial assistance.

✓ Check the insulation on the wires from the collector temperature sensor to the controller. If the insulation is melted or scraped off, separate the shorted wires and rewrap them with electrical tape.

✓ Are the wires from the controller to the storage tank temperature sensor disconnected or broken? If so, reconnect them.

If your system is not working and the problem cannot be traced to one of the simple temperature sensor problems above, it's probably best to hire a contractor who can fix the problem quickly and efficiently. The [Colorado Solar Energy Industries Association](#) (COSEIA) maintains a membership directory of contractors, some of whom have been certified by taking a test and adhering to a code of ethics. For a free COSEIA directory, call OEMC at (303) 6204 284 in metro Denver, or 1-800-632-6662 elsewhere in the state.

### *Your solar system is your friend. Spend a little with it.*

All solar systems require a little preventative maintenance. Keep a log of all maintenance on the system so future repair persons can see what's been done and spot long-term problems.

✓ The collector should be cleaned whenever it is dusty or dirty. Water alone is usually sufficient. Plastic glazing should be cleaned with mild soap and water. If the cover glass is broken, the interior absorber plate and insulation should be protected with a waterproof, opaque tarp that will not melt until the glass can be replaced.

✓ Glycol freeze protectants break down into acids with time and excessive heat. Check the pH, corrosion inhibitor and solution concentration at least once a year. Also, check the fluid immediately after it has been subjected to very high temperatures. This would happen if the pump was left off during extended periods of sunny weather. Inexpensive fluid test kits are available from solar suppliers.

✓ While most pumps are sealed and permanently lubricated or lubricated by the heat transfer fluid, some require periodic lubrication. Check the manufacturer's literature to see if your pumps or blowers require periodic lubrication;

✓ If your system has a pressure gauge, check it monthly to see if the pressure falls within the range recommended by the installer (usually 10 to 40 pounds per square inch).

✓ Inspect fittings and piping at least once a year for leaks. If a leak occurs, shut down the system immediately for repairs.

✓ Check the air vent annually to see if it's leaking fluid out or air in. The cap should be loosened two turns to allow air out of the system. Also, press the lever on the pressure relief valves and allow a tiny bit of liquid to escape to assure that they are operating properly.

✓ Sediment collects in the bottom of the tanks after time. Flushing out sediment and corrosion from tanks and pipes every five years will extend the life and improve performance of your system.

✓ Check pipe and tank insulation annually to make sure it is not damaged. Make sure that outdoor insulation is protected by waterproof sheathing. If your outdoor pipe insulation is protected by paint, it may need to be repainted periodically to protect it from the sun and rain.

✓ Check mounting bracket bolts for tightness and check roof penetrations for weather-tightness at least once a year.

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