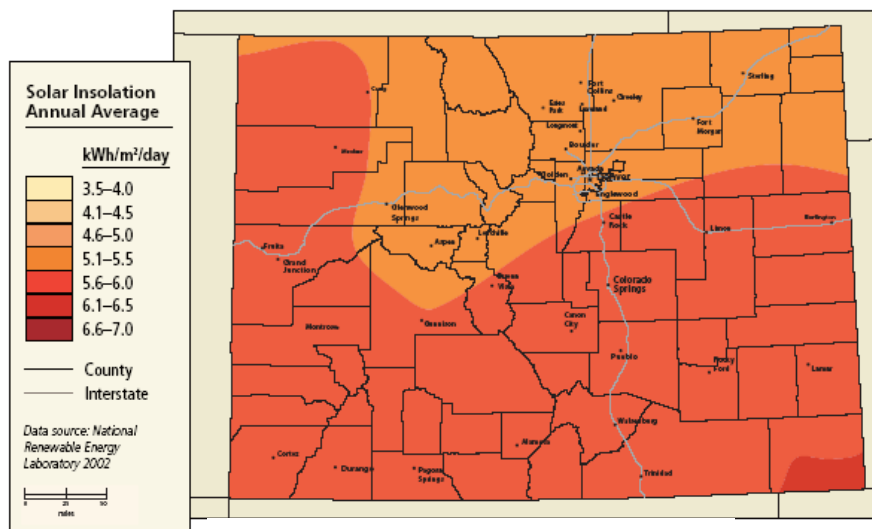




Solar Thermal and Photovoltaic

It is estimated that Colorado – one of the sunniest states in the country – could produce as much as 83 million megawatt-hours per year of its electricity from solar technologies. Before the end of 2007, Xcel Energy will install an 8-megawatt (MW) solar farm in Alamosa County. This will be the largest Concentrating Solar Power plant in the world, although Spain plans to catch up by building a 40-45 MW plant in Portugal in 2008.

Solar



Source: Renewable Energy Atlas of the West

Solar Technologies

Solar energy can be used to generate electricity or provide heat for buildings or hot water.

Concentrating solar power (CSP) systems – These systems use the sun to heat fluids, and the resulting steam or movement of fluids causes a turbine or generator to produce electricity. The three main types of CSP systems -- parabolic troughs, dish/engine systems, and power towers – use different configurations of mirrors to concentrate the sun’s energy. Tracking devices allow CSP systems to follow the sun and maximize energy output. Solar energy collected in a trough or dish can be used to drive a Stirling engine, which uses heat to produce power.



Power Tower



Parabolic Collector



Parabolic Collector

Passive solar – passive solar design optimizes the use of the sun’s light and energy in buildings through strategic architectural plans (southern exposures) and the use of materials that absorb heat.

Photovoltaics (PV) – convert sunlight directly to electricity as the sun hits electronics in semiconducting materials. The development of thin film solar cells has enabled PV to be installed in a variety of applications – such as glazing and shingles (which look like traditional building materials). Sunlight falling on translucent tile (or shingles) passes through the materials and heats underlying metal plates. The heat is transferred from the plates to a layer of air that moves beneath the tile or shingles and can be used for domestic hot water or radiant heating.

Solar process heat systems use solar collectors to pre-heat air before it enters a building. The energy from solar power can also be converted to provide cooling.

Solar hot water systems use flat plate collectors, which heat fluids passing through tubes. The liquid can move between the collector and the storage tank using pumps or by simply relying on gravity.

Daylighting is the use of natural light to provide illumination. Architectural features such as skylights, window orientation and exterior shading are designed to take advantage of sunlight and reduce the demand on electric systems. Certain paints and reflective materials, as well as built-in wall angles, are designed to reflect sunlight to areas of a building that are distant from the entrance of sunlight.

Hybrid systems Arrays of PV cells may be built in such a way as to track the sun and can be used in combination with a concentrating collector. Solar technologies can also be used in concert with other renewables, such as wind turbines and fuel cells.



Aspen, Colorado, boasts the first community-sponsored solar energy production incentive in the country. The Solar Power Pioneers Program pays homeowners a subsidy (\$.25 per kilowatt-hour for 4 years) for electricity produced at home with solar energy, such as with the PV system shown here.

Policies to Support Solar Development

Colorado Renewable Energy Standard (RES)

The RES requires affected utilities to obtain an increasing share of their energy from renewable resources: 3% by 2007; 6% by 2011 and 10% by 2015. Four percent of these amounts must come from solar and one-half of the four percent must come from on-site solar at customer locations.

Energy Policy Act of 2005 (EPACT)

EPACT offers tax credits for residential solar PV and hot water heating systems. The credit is 30% or up to \$2,000 for each system.

Utility Incentives

Several utilities offer net metering for photovoltaics and other renewables. Others offer rebates, grants and low interest loan programs for the purchase of solar technologies. See <http://www.dsireusa.org/library/includes/map2.cfm?CurrentPageID=1&State=CO&RE=1&EE=1> for a complete list of offerings by each utility.

Solar Access Laws

Colorado statute C.R.S. §38-30-168 limits restrictive covenants against solar installations and allows residents to create easements to allow access to solar radiation. The statute does allow for reasonable aesthetic considerations if they do not significantly increase the cost of the installation.

Million Solar Roofs/Solar America Initiative

Replacing the Million Solar Roofs program DOE has developed the Solar America Initiative – a proposed \$148 million program for fiscal year 2007. Funding opportunities will be available to support Market Transformation (to accelerate the development of advanced PV materials) and Technology Pathway Partnerships (R&D in component and system designs). For more federal incentives, please refer to <http://www.eere.energy.gov>.

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