

MILLION
Solar
ROOFS

SUCCESS STORIES

The goal of the Million Solar Roofs Initiative is to install one million solar energy systems on U.S. buildings by 2010. President Clinton announced the Initiative on June 26, 1997 in a speech before the United Nations Session on Environment and Development. The Initiative focuses on two types of solar energy technology — photovoltaics that produce electricity from sunlight, and solar thermal systems that produce heat for domestic hot water, space heating or heating swimming pools. The U.S. Department of Energy leads this effort in partnership with the building industry, other federal agencies, utilities, the solar energy industry, financial institutions, state and local governments, and non-governmental organizations. These partnerships concentrate on removing market barriers and developing and strengthening demand for solar energy products and applications. As progress is made toward the goal of one million solar roofs, greenhouse gases and other harmful emissions will be reduced, high tech jobs will be created, and the U.S. solar energy industry will retain its competitive edge.



Project: Residential Installation

Type: PV on-grid installation

Location: Carbondale, Colorado

In 1997 the Community Office for Resource Efficiency (CORE), a non-profit energy office in Aspen, Colorado, initiated a project to install photovoltaic systems on grid-connected homes in Colorado. CORE's director, James Udall, was one of the five participants. Systems ranged in size from 800 watts to 4.5 kW.

System Description: Mr. Udall installed a 1.8kW crystalline module, ground-mounted system. Two 12 module arrays were installed on 6 inch Schedule 40 steel poles, which were cemented into the ground immediately adjacent to Udall's home. The system included Siemens SP 75 watt modules, which came with a 25 year warranty, and Trace inverters, modified to be used in grid-tied applications. The mounting racks were built by Direct Power and Water Corporation. Crystalline modules, though more expensive than thin-film modules, were chosen because crystalline modules produce more power per square foot. During its first year, Udall's system produced 2,875 kilowatt-hours (kWh). That is an average of 7.9 kWh per day or about 235 kWh per month. Mr. Udall obtains 75% of his electricity from his PV system.

Mr. Udall takes advantage of net metering through his utility company. Net metering permits homeowners who install solar energy systems to sell excess electricity back to the utility. The building's electric meter runs backward when the system is producing more electricity than is being used by the house, then the customer is credited for this on his/her monthly electric bill.

Financing: Although photovoltaics are most frequently used in places where there is no electricity grid, Udall notes that so-called grid-connected PV systems offer many benefits. By using the grid as a "battery" to store excess energy, Udall avoided the need to buy batteries, a charge



controller, or a backup generator. This saved him about \$4,000 compared to with an off-grid system.

According to Udall, a PV system can be purchased for \$12,000 - \$15,000. By placing his order with the four other participants in the CORE program, Mr. Udall was able to bargain for a lower price. Udall estimates that his grid-connected PV system produces power for 25 cents per kilowatt-hour. He can buy power from his utility for 7 cents per kWh, making his net cost 18 cents/kWh. Since his system produces 7.9 kWh per day, the added cost to get 75% of his electricity from the sun is \$43 per month, or \$518 per year.

Climate: Photovoltaic systems produce more energy per day in the summer than in the winter, given the longer daylight hours. Udall's system averages about 9 kWh per day in the summer and about 6 kWh in the winter.

Total Installed Cost: \$13,000. To save money the homeowner did some of the installation himself.

Maintenance Issues: To date, the installation has performed flawlessly. The PV panels have a 25 year warranty. The inverter, which changes direct current from the panels to alternating current used by the grid, came with a 2 year warranty and an optional 3 year warranty extension. Udall jokes that his PV panels may outlive him and become heirlooms.

Direct Savings: The PV installation reduced the homeowner's annual electric bill by \$200, or about \$17 per month. Over the system's projected twenty-five year lifetime, the homeowner will save \$5,000 on energy bills.

Environmental Benefits: By using solar power to displace coal-fired electricity, the installation keeps an estimated 5,750 pounds of carbon dioxide, the chief greenhouse gas, out of the air each year, or about 16 pounds per day. (Producing one kilowatt-hour requires one pound of coal. When burned, the carbon in the coal combines with oxygen in the air to produce about 2 pounds of carbon dioxide.) The average American home contributes 23,380 pounds of carbon dioxide into the atmosphere each year. This system reduces that by 25%. Wanting to make further reductions, Udall installed a solar hot water heater costing \$2,500. It saves 3,600 kilowatt-hours per year, equal to 7,200 pounds of avoided carbon dioxide. Together the solar hot water heater and the PV system will keep 259,000 pound of carbon dioxide out of the atmosphere over the next 20 years.

For additional information on the CORE program or James R. Udall's grid-connected PV system contact: James R. Udall, Director; Community Office for Resource Efficiency; PO Box 9707; Aspen, CO; 81612. E-mail: rudall@aol.com

DOE Regional Support Offices

Atlanta Regional Support Office

Steve Hortin, 404/347-0239
730 Peachtree, NE, Suite 876
Atlanta, GA 30308
fax: 404/347-3098
Southeast Region: FL, GA, SC, NC, AL, MS, KY,
TN, AR, USVI, PR

Boston Regional Support Office

Richard Michaud, 617/565-9713
One Congress Street
Room 1101
Boston, MA 02114-2021
fax: (617)656-9723
Northeast Region: CT, ME, MA, NH,
NY, VT, RI

Chicago Regional Support Office

Mark Burger, 312/886-8583
Julie Pollit, 312/886-8571
One South Wacker Drive
Chicago, IL 60606
fax: 312/886-8561
Region: IL, IN, IA, MI, MN, MO, OH, WI

Denver Regional Support Office

Steve Sargent, 303/275-4820
1617 Cole Blvd.
Golden, CO 80401-2266
fax: 303/275-4830
Region: CO, KS, LA, MT, NE, NM, ND, OK, SD,
TX, UT, WY

Philadelphia Regional Support Office

Susan Guard, 215/656-6965
1880 John F. Kennedy Blvd.
Suite 501
Philadelphia, PA 19103-7483
fax: 215/656-6981
Region: DE, DC, MD, NJ, PA, VA, WV

Seattle Regional Support Office

Curtis Framel, 206/553-7841
Michael Lottier, 206/553-2156
800 Fifth Ave., Suite 3950
Seattle, Washington 98104-3122
fax: 206/553-2200
Northwest Region: AK, WA, ID, OR, CA, NV,
AZ, HI, Pacific Territories

Hawaii only:

Eileen Yoshinaka, 808/541-2564
300 Ala Moana Blvd.
Honolulu, HI 96813
fax: 808/541-2562

For more information:

By phone:

Efficiency and Renewable Energy Clearinghouse (EREC)
1-800-DOE-EREC (363-3732)

On the Internet:

Million Solar Roofs Website
www.MillionSolarRoofs.org

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Renewable Energy