

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. 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: Channel Islands National Park PV installation

Type: Off-grid PV installation

Location: Santa Rosa Island, California

Background: Channel Islands National Park has a history of utilizing renewable energy to provide power and reduce fossil fuel consumption on the islands. Due to the proven ability of solar technologies to meet other island energy requirements, the decision to utilize solar energy for the new housing area was easy. Solar energy technologies are particularly well suited to the island, where diesel is expensive and risky to transport. On the islands, as in other non-grid applications, solar energy is the clear choice to provide power with minimal maintenance or intrusion and in a clean, quiet, non-resource depleting manner.

System Description: Santa Rosa Island is a 52,794 acre island off the Santa Barbara coast, 44 miles west of the Park headquarters in Ventura, California. It was incorporated in the Channel Islands National Park in 1980 and purchased by the National Park Service on December 29th, 1986. The park employee housing site is located in a remote location on the island which requires its own independent power systems. To provide energy to the housing facility, two off-grid 6.4 kW photovoltaic systems were installed in May 1998. (Four solar hot water systems were also installed in August 1988. See Channel Islands solar hot water case study).



All of the system hardware was purchased through a General Services Administration contract. Siemens Solar of Camarillo, California provided the solar modules and mounting racks used in the project. The 116 SM55 modules are mounted on 13 SGM-8 mounts, which were installed on the rooftops of the adjacent garage structures. Applied Power of Lacy, Washington provided the balance-of-systems including the combiner boxes, batteries, and inverters. Applied Power obtained the Power Panels from Trace Engineering of Arlington, Washington. The SW5548 Power Panels deliver approximately 11 kW each. The Battery Storage Banks each consist of eight 6 volt batteries which are wired in series to 48 volts DC. Combined they provide 102 kWhrs of electrical storage for each system.

Each system has the potential to produce 35.2 kW of electricity daily and 12,848 kW annually. However, the actual (metered) consumption will be less. Once the batteries are fully charged and loads are provided for, excess electricity is shunted off. In the event that occasional fog prevents adequate power production, or power consumption demands increase, supplemental power could be generated by 300 watt wind chargers that take advantage of the excellent wind power conditions on the island.

Financing: Each system was financed through federally appropriated construction funding as part of the electrical system required for the housing project. No outside or grant funding was requested or received. The island's unique set of

energy requirements and location make the systems economical. For example, due to the logistics of supplying fuel to an island 45 miles offshore, there are added costs for fuel deliveries. For every 2400 gallons of fuel delivered it takes one boat trip, which consumes 350 gallons of fuel, and 36 employee man hours. The hidden costs mean that generation fuel used by the island is 57% more expensive than mainland fuel.

Climate: The systems operate in a marine environment without temperature extremes. The temperature on the island seldom goes below the high 40's (F) or above the high 80's (F). The arrays receive an average of 5.5 hours of full sun per day. The primary effect of climate on the systems operating efficiency is the fog which can at times obscure the sky all day. However, solar insolation keeps the systems operational given sufficient energy can penetrate the clouds.

Total Installed Cost: Each photovoltaic system cost \$65,758 for a total cost of \$131,516.

Optimum Maintenance Costs: Annual maintenance costs are under \$100 per system.

Direct Savings: Simple payback will occur in 6.5 years and discounted payback will occur in 8.5 years. The savings will equal \$36,000 in 10 years, \$116,000 in 15 years, \$166,000 in 20 years, and \$246,000 in 25 years.

Environmental benefits: Had a fossil fuel burning generators been used to provide power instead of the solar technology, the generators would have burned, on average, over 10,000 gallons of diesel fuel per year, resulting in the following greenhouse gases: 119 tons of Carbon Dioxide; 5750 pounds of Nitrous-Oxides; 220 pounds of Total Suspended Particulates (TSP); 490 pounds of Hydrocarbons; 285 pounds of Sulfur Dioxides; and 8120 pounds of Carbon Monoxide.

In addition, the PV systems offer other environmental advantages. Due to the isolated location of Santa Rosa Island, there are pollution risks associated with fuel deliveries. The shipping movements and fuel transfers represent a potential for contamination of fragile marine environments and park lands even with containment measures in place.

When considering the air pollution, fossil fuel consumption, operational costs and potential for environmental contamination, the existing noise production of the diesel generators is hardly worth a second thought. However, the employees whose residences are within 100 feet of the new power generation facility also will benefit from the utilization of quiet renewable resources as a power supply.

Contact: Project Manager- Kent Bullard, Offshore Maintenance Supervisor, Channel Islands National Park, 1901 Spinnaker Drive, Ventura, CA 93001, kent_bullard@nps.gov 805-658-5745

U.S. Department
of Energy



Office of
Energy Efficiency and
Renewable Energy

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