

# Technical Assistance

## Case Study



## Renewable Energy at Channel Islands National Park

*FEMP's technical assistance helped NPS use renewable energy to safeguard pristine islands*

Visitors to Channel Islands National Park enjoy hiking, snorkeling, scuba diving, bird watching, and fishing. And now they'll also enjoy the benefits of renewable energy systems.

The park is located off the coast of southern California and comprises Anacapa, Santa Barbara, Santa Cruz, San Miguel, and Santa Rosa Islands, and the surrounding mile of ocean. It has 249,353 acres (100,910 hectares) that teem with terrestrial and marine life. The park boasts more than 2000 species of land flora and fauna (145 of which are unique to the area), and is on a migration lane for gray, blue, and humpback whales.

The National Park Service (NPS) protects the pristine resources at Channel Islands by conserving, recycling, using alternative fuel vehicles, applying renewable energy, and using resources wisely. It also seeks to replace conventional fuels with renewable energy wherever possible. This applies

especially to diesel fuel and petroleum, which must be shipped in from the mainland to generate electricity.

According to Kent Bullard of the NPS, "Channel Islands National Park has 63 renewable energy applications. Renewable energy is a viable alternative in remote areas where fuel is expensive or difficult to transport." Because the area has abundant solar and wind resources, the most commonly used alternative forms of energy are photovoltaics (PV) and wind. The park has systems in place that use 29.5 kilowatts (kW) of PV and 21.5 kW of wind. This case study discusses specific applications on four of the five islands.

### Santa Rosa Island

In September 1995, a grant from the U.S. Department of Energy's Federal Energy Management Program (FEMP) allowed the park to implement a hybrid wind/PV energy project on Santa Rosa, the largest of the Channel Islands. The project is jointly funded by FEMP, the Santa Barbara County Air Pollution Control District, Sandia National Laboratories' Photovoltaic Assistance Design Center, and Channel Islands National Park.

The energy system consists of:

- Two 10-kW wind turbines and a 12.6-kW PV array
- One 30-kW, three-phase bimodal inverter to control battery charging and provide seamless 208/120 AC electricity
- A system controller to monitor and regulate the power generated by the wind turbines and PV array, and to activate backup generators as needed
- A 300-kW (capacity) battery bank.

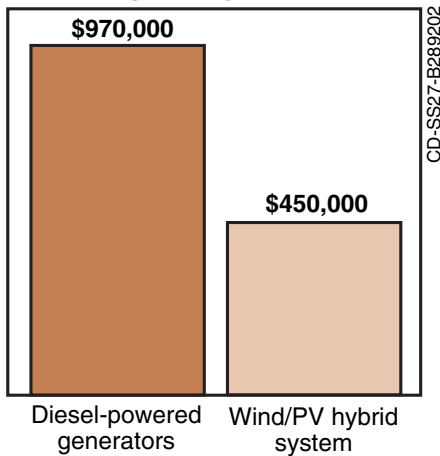
This system, which is now in the final stages of integration, will supply electricity to the ranger station, facilities,



Kent Bullard, National Park Services/PIX05426

*A hybrid wind/PV energy system powers the ranger station on San Miguel Island.*

## Life-cycle system cost



and residences. It will essentially replace a 35-kW diesel generator that uses 17,500 gallons (66,244 liters) of diesel fuel and 120 gallons (454 liters) of motor oil each year. The diesel generator will be used as a backup. The estimated project cost is \$375,294. See the figure for differences in life-cycle costs between the diesel generator and the hybrid system.

### San Miguel Island

San Miguel is the third-largest island at 9325 acres (3774 hectares). It currently boasts several renewable energy projects, including a ranger station with a 12-volt DC hybrid wind/PV system, a Grundfos water pumping system, a 12-volt PV power system for the research station, a Handar weather station, and a U.S. Navy 12-volt weather station. A new 2200-square-foot (204-square-meter) ranger station was recently completed, and incorporates a 900-W wind/PV power system, solar water preheater, rainwater collection for toilet flushing, low-flush toilets, nine solar tube skylights, three Sunfrost refrigerators, and low-volt fluorescent lighting.

### Anacapa Island

Anacapa is the second-smallest island at 699 acres (283 hectares) and has the park's highest visitation rate. In 1983 a 10-kW PV array was installed on its old fuel building; the array was reconfigured in 1987. Until 1992, a lighthouse and navigational aids were powered by 10-kW diesel generators. The U.S. Coast Guard reconfigured the lighthouse, implemented conservation measures, and converted the system to operate as a stand-alone PV system.

The system cost \$17,498 and had a 3 1/2-year payback.

In 1994 a small PV array was installed to provide electricity to the visitors center and bunkhouse.

These measures have reduced the island's total diesel fuel consumption from more than 14,700 gallons (55,645 liters) annually to 263 gallons (995 liters) in 1996.

### Santa Barbara Island

At 652 acres (264 hectares), this is the park's smallest island. It has a 1850-square-foot (172-square-meter) ranger station that was constructed in 1990. It includes a visitors center, a four-person bunkhouse, and a two-bedroom apartment for the resident ranger.

The station incorporates a 5-kW stand-alone PV array that consists of 80 Siemens M-75 modules, 48 Trojan T-105 batteries, an SES controller, and a Westec 5048 inverter. The system provides the entire electrical supply to the station and has no backup generator. It displaces approximately 4000 gallons (15,142 liters) of diesel fuel annually. The system paid for itself in 3 1/2 years and now operates cost free.

### Environmental benefits

One of the greatest environmental concerns about using fossil fuels in the Channel Islands is that these fuels must be shipped in from the mainland. They must be transferred from the ship to the tanker truck to the generators, and there is always the risk of a spill during any of these stages. Also, diesel systems discharge many harmful pollutants into the atmosphere.

Once the Santa Rosa project is implemented, about 36,000 gallons (136,267 liters) of diesel fuel will be displaced in the park. This will eliminate

- 428 tons (390 tonnes) of carbon dioxide
- 20,700 pounds (9410 kilograms) of oxides of nitrogen
- 792 pounds (360 kilograms) of total suspended particulates
- 1764 pounds (800 kilograms) of hydrocarbons
- 500 pounds (227 kilograms) of sulfur dioxide
- 14,200 pounds (6450 kilograms) of carbon monoxide.

### Economic benefits

For every 2400 gallons (9085 liters) of fuel delivered to the islands, the required boat trip consumes 350 gallons (1325 liters) of diesel and takes 36 employee hours. These hidden costs mean that the Channel Islands' fuel is 57% more expensive than mainland fuel. Also, if one catastrophic oil spill should occur, the cleanup alone would cost \$1 million to \$1.5 million. Resource restorations and facility repairs would add costs.

Preserving natural resources with renewable ones makes sense for the Channel Islands, and the NPS continues to find ways to use clean, renewable energy to meet its needs.



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