

GREEN TEAMS: UNIVERSITY-NATIONAL PARK ENERGY PARTNERSHIP PROGRAM

University of Michigan & Sleeping Bear Dunes National Lakeshore

OVERVIEW. The University of Michigan's College of Architecture and Urban Planning teamed up with Sleeping Bear Dunes National Lakeshore to explore options for a photovoltaic (PV) system for South Manitou Island, and to conduct an energy audit of the park's visitor/headquarters building.

PHOTOVOLTAIC SYSTEM DESIGN. The project team updated and expanded a 1995 Currin Corporation report that recommended a PV-diesel hybrid power system for South Manitou Island. A PV system could conceivably eliminate the need for diesel generators, or at least allow for more efficient operation of the generators. Student members of the project team gathered electricity usage data for 1994-99 in generating an updated plan for implementation of a PV system.

During their investigation, the project team noted that electricity demand on South Manitou Island has experienced a consistent annual increase due to higher occupancy and a switch to all-electric operations in buildings. Unfortunately, past improvements for energy efficiency (including a 1997 lighting retrofit) have not kept up with this increase in demand. After examining data and costs, it was concluded that demand reduction would be needed if a PV system were to work successfully.

The project team developed three power system options. The first option would be a return to propane for some operations on the island, which would help reduce electricity demand. The second option would be to install a PV array but still rely on diesel during the day (a battery bank could be charged during daylight hours and used at night). The third option would be to use PV alone, which would be ideal from an energy standpoint but would entail high costs.

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As the project team's report noted, the "use of PV [on South Manitou Island] is part of a more sustainable power facility and fits well with the Park Service's mission of stewardship of the land under its care."

Partnership Successes

- Exploration of use of a photovoltaic system as an addition to the power system on South Manitou Island.
- Complete energy audit for the Sleeping Bear Dunes National Lakeshore visitor/headquarters building, including energy conservation measure recommendations.

ENERGY AUDIT & ANALYSIS. A second team of University of Michigan students completed an extensive energy audit and analysis of the large headquarters building at Sleeping Bear Dunes National Lakeshore. Using data-gathering sensors for temperature, lighting, and humidity, and sophisticated software packages, students constructed computer models of the headquarters building. Building parameters (spatial, construction, equipment, lighting, occupancy rates, and mechanical system specifications) were applied to the models, and the model output was compared to building's actual performance.

The modeling process resulted in recommendations for the lighting system, the building structure, and the ducting and mechanical systems. The primary lighting recommendation focused on the use of natural lighting through skylights. The report also recommended that lighter, reflective colors replace the darker, non-reflective tones now on the cubicles and walls.

Recommendations for the building structure generally focused on more effective use of insulation. Mechanical systems recommendations included down-sizing some units to achieve higher efficiency, and redesigning the ductwork for simplicity and efficiency.

SUMMARY. The Partnership was highly successful, providing value to both the park and to several students at the University of Michigan. Further collaborations between the two partners are expected, with several projects already in the proposal stage.

PERSONNEL. Personnel involved in both parts of this project included Ali Malkawi, Ph.D., Program Manager; Dan Krieger, Energy Coordinator for Sleeping Bear Dunes National Lakeshore; and Pete La Valley, Maintenance Supervisor for Sleeping Bear Dunes National Lakeshore. Geoff Lewis was the Research Associate for the PV system design. Karl Daubmann was the Oberdick Fellow for the energy audit and analysis, and received assistance from a group including Ruchi Choudhary, Dominique Jean Price, Ami Amal Dhruva, and Rina Sahay.