

# The Nevada 1-MW Solar Dish-Engine Project

*Solar dish-engine systems, in particular Dish-Stirling systems, have demonstrated technical feasibility and high efficiency. The Nevada 1-MW Solar Dish-Engine Project addresses the two main hurdles delaying the entry of these systems into power generation markets: the demonstration of reliability and system cost reduction.*



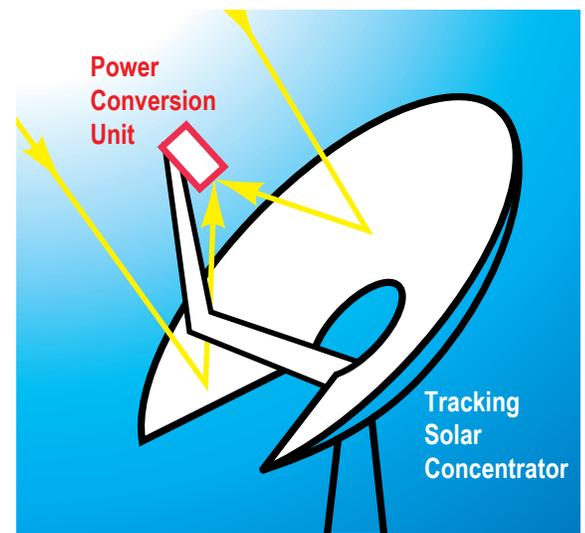
**As a precursor to the Nevada Solar Dish-Engine Project, two Dish-Stirling Systems were installed and are operating on the campus of the University of Nevada Las Vegas.**

The objective of the Nevada 1-MW Solar Dish-Engine Project is to demonstrate 1 megawatt of dish-engine, field-validation, power generation systems in a solar plant near Las Vegas, NV. The installation and testing of the systems will occur over a period of three years starting in 2002 and continuing through 2004. The project is a transition of dish engine systems from research and development into a pre-commercial deployment of the technology. The project will demonstrate and collect data on the performance, operation, and reliability of the systems in a power plant environment. The project also builds a sufficient number of systems (40 or more) to address manufacturing issues and processes to substantially reduce the cost over hand-built systems.

## The Technology

A Solar Dish-Engine System is an electric generator that "burns" sunlight instead of gas or coal to produce electricity. The figure shows the two major parts of a system – the solar concentrator (or dish) and the power conversion unit (PCU). The dish tracks the sun over the course of a day and reflects concentrated sunlight

to a single point, its focus, where it is converted in the PCU into heat to power an engine/generator to produce electricity. These systems are modular, allowing their assembly into plants ranging in size from a few kilowatts to tens of megawatts. They are made from readily-available materials (steel, aluminum, and glass) using conventional manufacturing techniques common to the automotive industry.



**Solar dish-engine system schematic.**



The most common type of engine used in dish-engine systems is the Stirling engine. Dish-Stirling systems range in size from 9 to 25 kilowatts. A Dish-Stirling system has demonstrated a peak conversion of 29.4% of the sunlight falling on the dish into electricity. While the initial focus of this project is the deployment of Dish-Stirling systems, in the future the project may also support the testing of dishes with other types of engines, including microturbines and photovoltaic conversion devices.

## The Project

The Nevada 1-MW Solar Dish-Engine Project exploits the complimentary strengths of the Department of Energy (DOE) and its National Laboratories, the University of Nevada Las Vegas, and private industry to advance the development of clean, renewable, solar dish-engine technology in Nevada.

The solar dish industry is responsible for developing the project, securing a power-purchase agreement, building and installing the dish-engine systems, operating and maintaining the solar power plant, and collecting data on performance, maintenance, and cost.

The University of Nevada Las Vegas (UNLV) is providing supporting solar dish engineering expertise, training, and education. Developing a base of highly-trained technicians and engineers is critical to the development of the solar

dish industry and the future deployment of dish-engine power plants.

DOE's Concentrating Solar Power (CSP) Program will provide funding for the project. SunLab, a virtual laboratory comprising the CSP programs at Sandia National Laboratories and National Renewable Energy Laboratory, will work with industry on systems-related issues, including systems control, data acquisition, component failure analysis and correction, advanced component design and evaluation, and cost and systems studies to help assure the systems will operate as efficiently as possible.

The current project schedule calls for a competitive procurement for the project to be released in October 2001, with one or more contract awards planned for March 2002. Installation of systems is expected to begin in October 2002 and be completed by October 2003. System operation will continue at least through 2004.

## The Vision

Following completion of the Nevada Solar Dish-Engine Project in 2004, the dish-engine power plant will continue to operate in a sustainable manner. It is anticipated that the solar dish industry will secure power purchase agreements and begin installing solar dish power plants on a commercial scale.

For on-line information about **Sun♦Lab**, please visit <http://www.eren.doe.gov/sunlab>. Information about the U.S. Department of Energy's Concentrating Solar Power Program can be found at <http://www.eren.doe.gov/csp>.



Produced for the  
**U.S. Department of Energy (DOE)**  
1000 Independence Avenue, S.W.  
Washington, DC 20585-0121



Produced by **Sun♦Lab**:  
Bringing together solar energy expertise from Sandia National Laboratories and the National Renewable Energy Laboratory, DOE national laboratories.

SAND2001-2533P  
August 2001