Concentrated Solar Power Generation Systems: The SAIC Dish

Center for Energy Research UNLV

The SAIC Dish

Concentrating Solar Dishes

- Work has been underway at UNLV's Center for Energy Research since 2001 in the use of concentrating solar dishes for electrical power generation.
- One of these solar dishes was marketed by Science Applications International Corporation (SAIC). The dish powered a Stirling engine.
- This project, originally funded by the U.S. Department of Energy, had several goals including:
  - Train students in the theory and operation of dish systems,
  - Improve reliability of these types of units, and
  - Improve the design and operational characteristics of the system.
- The original project ended in December 2002. However, two new but related projects were then pursued, both funded by the National Renewable Energy Laboratory.

Concentrating Solar Dishes Cont.

- With this type of solar dish, the sun is reflected off of an array of mirrors onto a target. The dish moves constantly throughout the day to track the sun, resulting in a very high intensity solar beam on the target. This beam can be used to power a photovoltaic cell array or a thermal system.
- This unit develops about 25 kWe at maximum operational conditions, and the generated power is fed into the Nevada power grid. NV Energy cooperated with the project, and furnished the interconnection equipment.

SAIC Dish Modifications (1 of 3)

- SAIC's solar dish after being refitted with fixed-focus mirrors

SAIC Dish Modifications (2 of 3)

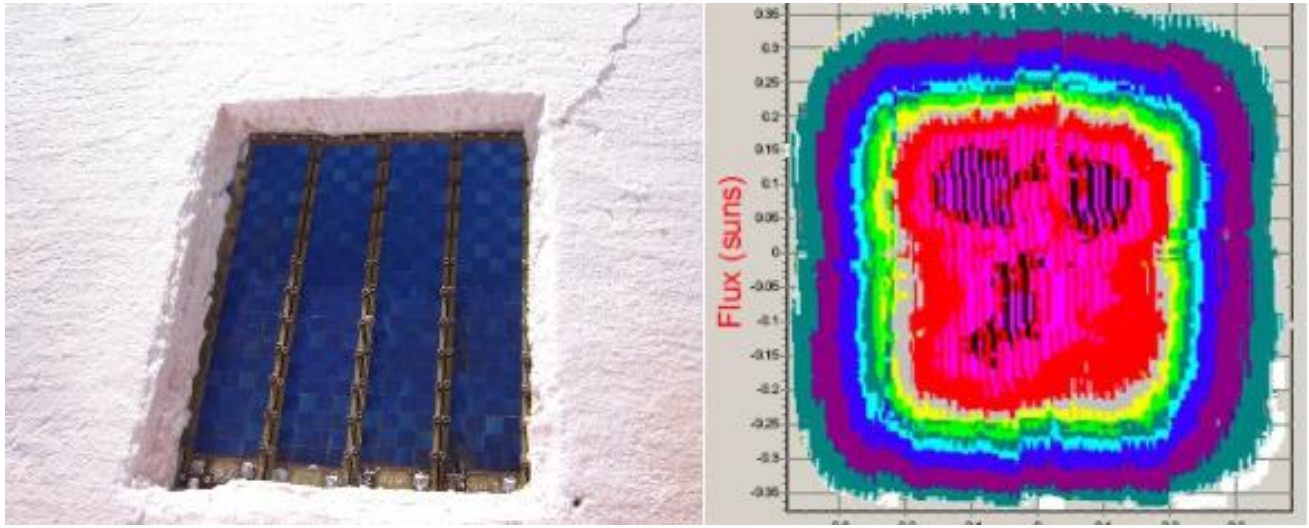
- Several modifications to the SAIC dish in 2003 included the replacement of the stretched membrane facets it originally had with a hexagonal fixed-facet design.

SAIC Dish Modifications (3 of 3)

- Another modification was that a photovoltaic (PV) receiver, shown at right mounted on a boom, replaced the original Stirling engine.
- This unit has an air-cooled radiator unit to draw heat from the PV receiver. A cell cooling unit under construction is shown to the right.

Testing

- In one of the conducted tests, a small configuration of the PV cells of the receiver was surrounded by high-temperature insulation (left) was irradiated with the reflected beam. At right, a flux map of the sun on the receiver shows the various temperature zones.



Immersion Cooling of PV Cells

- In a joint project with Tianjin University in China, cells were mounted in a tube through which water flowed for cooling, then irradiated with the dish. It was found that the cell temperatures could be quite accurately controlled. Some degradation of cell performance occurred over time, which was assumed to be due to the mounting method
- **Key**

1. Glass tube assembly
2. Assembled unit with reflective shroud and insulation
3. Insulation
4. Bare tube

Sponsors and Participants

Entity	Website
Science Applications International Corporation (SAIC)	www.saic.com
NV Energy	www.nvenergy.com
U.S. Department of Energy	www.doe.gov
National Renewable Energy Laboratory	www.nrel.gov

Publications

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