Solar Film for Bare Base Power

A Collaborative Effort between the US Air Force Research Laboratory (AFRL/MLQ), Academia, and Industry

THE PROBLEM:

In a Bare Base home of one squadron, shelters cover almost six acres of land. The use of this vast area for solar power to electric conversion is possible due to thin film photovoltaic (PV) and lithium polymer battery technologies. Incorporating lightweight flexible PV/ battery sheets into shelters' skins can generate and store solar electrical energy and provide needed electrical power during the day.

Shiekh Issa Bare Base, Bahrain

THE OBJECTIVE:

This effort develops and integrates an efficient, flexible, and lightweight solar cell/battery roll into bare base shelters for electrical power generation.

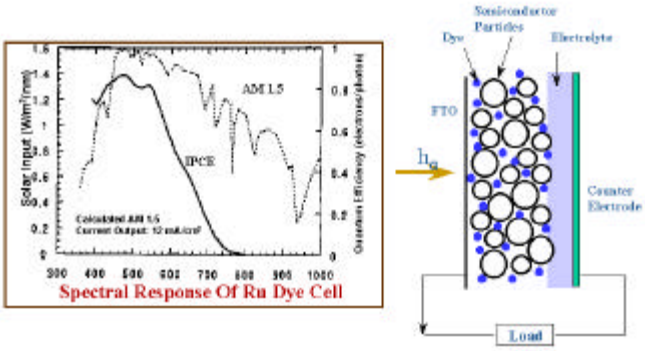
Solar Power Concept for Bare Base

APPROACH:

Electric power needs on a Bare Base for one squadron deployment reach 1.8 MW peak. Current PV technologies are four to ten percent efficient and will generate up to 0.55 MW of average power for a cost of $10 per peak watt. The use of 30 percent efficient thin film PV cells will produce 1.65 MW of average power during the day. This more than meets Bare Base power needs. AFRL/MLQC identified two molecular PV technologies that have the potential for high efficiency in the range of 25 to 30 percent and low cost in the range of $40 per peak watt.

One of these technologies is the PV cell employing nano-crystalline semiconductor. It is a proven technology with 11 percent efficiency. Research efforts are underway to develop a dye-semiconductor combination with spectral response that mimics solar input. Expected efficiency of this type of solar cells is in the range of 25 to 30 percent with a manufacturing cost of $40 per peak watt.

The lithium polymer battery is another breakthrough that makes it possible to use solar power on Bare Bases. AFRL/MLQC is investigating the integration of solar power as a hybrid power source with conventional power generators. A prototype system, using current technologies, is designed and will be tested at Tyndall AFB, Florida.



Potential Prototype Systems

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