

solar energy

# Taking Reflection to the Next Level

Private industry and NREL are working together to cut the costs of parabolic trough collectors

by D. Drew Bond

The US Department of Energy's Office of Energy Efficiency and Renewable Energy (EERE)'s Commercialization Team is charged with the task of accelerating the deployment of emerging energy technologies into the marketplace. The Team works closely with various EERE program offices, national research laboratories and private industry, and has a number of initiatives designed to assist in bridging the "commercialization valley of death" between the laboratory and the marketplace. Among them – the establishment of an Entrepreneur in Residence program at DOE national laboratories, designed to increase the number of startups coming from the Labs. The Team also played a part in the development of the Technology Commercialization Fund (a total of \$7 million in FY 2008), which serves as early stage seed capital, along with private partners, for moving lab research closer to the market.

Primarily the EERE Team focuses on developing partnerships between national laboratories and private industry to help overcome commercialization obstacles and move clean energy technology to the marketplace. One such partnership, as detailed here below, was developed between an independent researcher and DOE's National Renewable Energy Laboratory (NREL).



▲ *ReflecTech Mirror Film co-inventor (and SkyFuel CTO) Randy Gee, measuring the reflectance of ReflecTech mirror Film panels at the SEGS VI plant in Kramer Junction, California.*

## Solar reflector material: opportunity for innovation

In the late 1980's, as the first commercial scale Concentrating Solar Power (CSP) plants were being built in the Mojave Desert, there was a concerted effort to use reflective films instead of glass mirrors in the interest of keeping costs down. Despite the best efforts of leading film makers, those attempts proved to be unsatisfactory as the early silverized films were unstable and degraded in the desert environment. As a result,

glass mirrors became the default standard in CSP plants for reflecting sunlight onto the heat collection receiver tubes of those systems.

In the lab, efforts to produce a durable, reflective film continued. Independent researcher Randy Gee, along with National Renewable Energy Laboratory (NREL) engineer Gary Jorgensen, worked to form a cooperative agreement designed to confront the challenge of developing affordable, durable and highly-efficient solar reflector material.



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The Department of Energy funded NREL's and Gee's early research through a \$25,000 grant.

At NREL, Gee found a wealth of expertise in reflector material research and state-of-the-art testing facilities. He and Jorgensen had access to NREL's world-class testing equipment, which maintains certain conditions necessary to achieve highly accelerated testing of reflector samples.

"Having the opportunity to work with one of DOE's National Laboratories isn't just for large businesses – there are opportunities available for small businesses as well," says Gee. "A little money, and a lot of hard work and cooperation can go a really long way."

Over a period of ten years at NREL's state of the art testing facilities, Gee and Jorgensen developed a breakthrough solution for affordable, durable and highly-efficient solar reflector material.

Together they submitted their invention for patent-approval and were jointly awarded a patent for ReflecTech Mirror Film in 2007.

ReflecTech Mirror Film is a highly-reflective, silver-metalized and outdoor-weatherable film that is easy to maintain and delivers the performance of traditional glass mirrors at a fraction of the cost and weight. The technology has proven significant in cutting costs from traditional glass-mirrored parabolic troughs.

At SkyFuel, where Randy Gee is Chief Technology Officer, the company's SkyTrough collectors are designed to deliver the reliability of traditional glass-mirrored parabolic troughs but with several economic and performance advantages, which stem largely from the use of ReflecTech film instead of sagged-glass mirrors. ReflecTech is not only significantly lighter in weight and less expensive than sagged-glass mirrors,

◀ *ReflecTech film on a SkyTrough solar collector.*

it will not break or shatter as glass can.

ReflecTech mirror film comprises multiple layers of polymer films with an inner layer of pure silver to provide for high specular (mirror-like) reflectance. This special patented construction protects the silver layer from oxidation. The Solar Film also has a pressure sensitive adhesive protected by a peel-off liner, which allows application to smooth, non-porous surfaces.

The ReflecTech film is laminated onto curved aluminum panels which are integrated into an aluminum space frame to form the SkyTrough parabolic trough concentrator. The entire assembly is mounted on pylons and attached to a self-locking rotary hydraulic drive, which enables the SkyTrough to pivot and track the sun.

For information on the DOE EERE Commercialization Team and collaborative opportunities with DOE's National Laboratories on energy technology, visit [www.eere.energy.gov](http://www.eere.energy.gov).

*D. Drew Bond is the Director for Commercialization & Deployment, Office of Energy Efficiency & Renewable Energy (EERE), U.S. Department of Energy. ([www.doe.gov](http://www.doe.gov).)*

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