

# Stirling Lives!

**Two companies join up to deploy 19th-century technology at the solar front.**

**By Gar Smith**



**W**ho could have guessed that a 191-year-old engine design would become the newest ally of the solar revolution? Under a recent co-development deal, Solana Beach, California-based Open Energy and Kennewick, Washington-based Infinia have joined forces to provide a novel source of cheap electricity and clean drinking water.

The idea centers on using Open Energy's SunCone solar concentrators to produce steam to power Infinia's Stirling engines hitched to electric generators. The result: virtually free electricity with no burning of fossil fuel and no greenhouse gases.

The SunCone, designed by Los Alamos National Laboratory scientist Melvin Prueitt, manages heat transfer so effectively that the cone's outer shell remains cool to the touch while its core reaches 700°F. And now, with their 7-foot-high prototype SunCone for powering up a 3-kW Stirling engine in place, the partners say a commercial version of the cone should be up and running within weeks.

Scottish inventor Robert Stirling built his first "external combustion" engine in 1816. Unlike internal combustion motors, Stirlings have no crankshaft and only one piston that moves through a closed cylinder filled with helium, nitrogen, or hydrogen. Applying heat (and/or cold) creates the needed temperature differential to get the piston pumping. Maverick engine designs borrowed from Stirling — the Wankel rotary design in the Mazda RX-8 being one example.

Stirlings tell a nice velocity story, but they've made their mark in electricity generation, too. Their efficiency and durability have endeared them to NASA, the Pentagon — and Southern California Edison (SCE), which plans to buy 20,000 Stirlings over the next 20 years to produce 500 Mw of electricity at its 4,500-acre solar farm in the Mojave Desert.

SCE's solar farm uses fields of parabolic mirrors to focus the sun's heat onto centralized Stirling engines — a process that loses a lot of heat as it's transferred through the air. Mr. Prueitt's design solves this problem by turning the solar-farm concept "outside in" — by essentially hoarding the heat inside the reflector.

As Open Energy CEO David Saltman explains, not all reflectors are created equal. "If a parabolic reflector is 'off-sun' by one degree," he says, "90 percent of the energy will miss the target, whereas SunCones can be 3 percent off and still capture 75 percent of the energy."

While Open Energy focuses on the design and marketing of solar-building materials, Infinia pushes Stirling technology wherever it can; it's been shipping engines for more than 20 years and now sells 1-kW engines for residential heating and electricity in Asia and Europe.

Mr. Saltman sees a kind of perfect storm. "All the fundamentals are in place for long-term growth — rising fossil fuel costs, the real risks of global warming, concerns about energy security, political instability in the Middle East," he says.

"Government, industry, and public support for energy alternatives will drive the market for the next 20 years."

Rodrigo Prudencio of San Francisco-based Nth Power allows that "Stirlings have great potential" but points out that their greatest success to date has been in smaller applications. "To make them large enough and reliable enough to produce grid power will still take some progress."

But the central grid is just the place Open Energy doesn't want to go. "We believe in turning that [centralized] model inside out and using distributed generation to create affordable power and clean water," Mr. Saltman says. "There are 1.5 billion people without access to electricity or fresh drinking water so there is a tremendous opportunity globally to create small, lightweight projects" to serve this market.

Efficiency comparisons published by Sustainable Resources show the SunCone outperforming both PV collectors and parabolic trough reflectors. While they found that the cost per square meter of collection surface was \$400 for dish reflectors, for example, SunCones were expected to harvest the same amount of energy for \$138.

Hedge fund Cornell Capital was impressed enough to pour \$15 million into Open Energy's efforts. David Andresen, a senior banker at Cornell Capital, sees global electricity usage soaring and only solar or nuclear technologies up to meeting the demand. "[SunCone] is the only true plug-and-play solution when it comes to solar."