

# Keeping it Clean

with Mike "Moose" O'Malley



## 30-Nov-2004 – Solar Power and Stirling Engines

This week, there have been some very exciting developments in renewable energy.

In Phoenix, Arizona, **Sandia National Laboratories** announced that they are joining forces with **Stirling Energy Systems Inc. (SES)**, with funding from the US **Department of Energy (DOE)**, to build and install six **Dish Stirling Systems** for electricity generation. When connected to the electricity grid in early 2005, this setup will generate enough electricity to power more than 40 homes.

And, this is just for starters. In 2006, a 40-dish power plant that will transform the combined output of the farm from 480 V to 13,000 V, for distribution of industrial-level power to an existing substation. From 2007 to 2010, the program proposes mass-producing dishes to create a 20,000-dish farm supplying 230,000 V of long-haul power from its own substation directly connected to the grid.

Eventually, according to DOE estimates, an 11-square-mile farm of Dish Stirling Systems could generate as much electricity as the **Hoover Dam**, and a 100 x 100-mile farm could supply all the daytime needs for electricity in the United States.

By storing the energy in **hydrogen fuel cells** during the day, Stirling solar-dish farms could supply U.S. electrical-energy needs at night too, as well as enough juice for future fuel-cell-powered automobiles, the DOE believes

Dish Stirling Systems are an exciting clean energy generation system with enormous potential. If all goes well in the US, then it is only a matter of time before this clean electricity generating technology find their way to sun-drenched Australia.

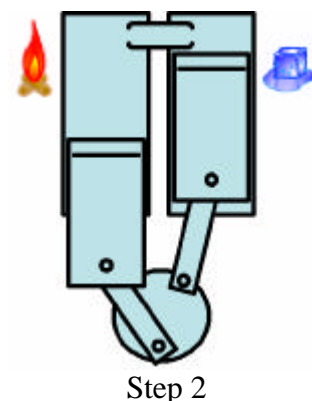
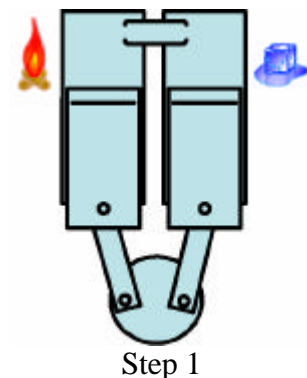
These 25 kilowatt (KW), prototype Dish Stirling Systems currently cost about **\$150,000 US** each to build. However, in production volumes, the cost should be reduced to less than \$50,000 US per unit, which would be competitive with some commonly used fuels.

This is indeed exciting news for renewable, clean energy supporters and our environment.

But what is a Stirling Motor ? And how do these Dish Stirling Systems work ?

At the heart of every Dish Stirling System is a Stirling Motor, and the design of these is based on an engine invented by the Scottish minister **Robert Stirling** in **1816**.

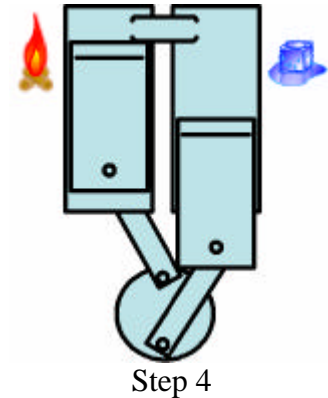
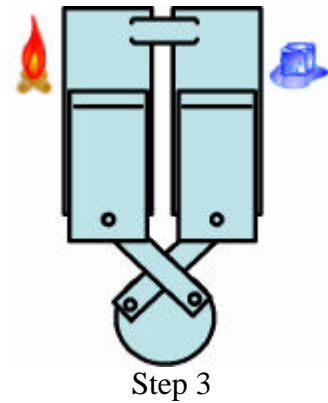
The Stirling Motor used in the Sandia project converts heat from the sun to power an engine which generates electricity. The engine is a closed system that produces no emissions or pollution.



A Stirling engine uses the **Stirling Cycle**, which has some unique properties and is unlike the cycles used in internal-combustion engines.

- The gasses used inside a Stirling engine never leave the engine. There are no exhaust valves that vent hot, high-pressure gasses, as in a gasoline or diesel engine, and there are no explosions taking place. Because of this, Stirling engines are very quiet.
- The Stirling cycle uses an external heat source, which could be provided by gasoline, solar energy, or the heat produced by decaying plants. No combustion takes place inside the cylinders of the engine.

A basic Stirling Motor consists of two connected cylinders, each with their own sliding piston. One cylinder is constantly heated while the other is constantly cooled, and this heats the air in one cylinder and cools the gas in the other, causing gas expansion and contraction, and the pistons to move and work to be done. (See diagrams on right).



#### WEB Links :

- How Stirling Engines Work  
<http://travel.howstuffworks.com/stirling-engine.htm>
- Could A 200-Year-Old Engine Solve Today's Petrol Crisis ?, The Scotsman, June 5, 2004.  
<http://news.scotsman.com/scitech.cfm?id=637532004&20040607021427>
- Sandia Pushes Limits Of Solar Technology, C|Net, November 24, 2004  
[http://news.com.com/Sandia+pushes+limits+of+solar+technology/2100-7337\\_3-5466122.html?tag=cd.top](http://news.com.com/Sandia+pushes+limits+of+solar+technology/2100-7337_3-5466122.html?tag=cd.top)
- Sun Catchers Tuned To Crank Out The Juice, EETimes, November 22, 2004  
<http://eetimes.com/at/news/showArticle.jhtml?articleID=53700939>