

Frequently Asked Questions (FAQs)

January 2012



COMPANY AND SOLUTION

1. **What is the Cool Energy solution?**

Cool Energy has developed a thermal-to-electrical power generation system for the conversion of wasted heat from engines and industrial processes into clean electricity. This system is built around an innovative advanced-materials Stirling engine called the **SolarHeart® Engine** which converts low-temperature heat to electricity.

2. **How can I obtain a SolarHeart Engine ?**

Cool Energy is currently delivering pilot-stage 3kW engines to qualified evaluation customers. Once the pilot testing phase is complete, Cool Energy will be selling the systems through certified dealers. These dealers will be trained in the operation, installation and maintenance of the system. Cool Energy will maintain a published list of the certified dealers on the website (www.coolenergyinc.com).

3. **When will the system be available?**

General availability to the public through a certified Cool Energy dealer will be approximately late 2012. Cool Energy will be placing a limited number of pilot systems for qualified field trials between now and Mid 2012. These pilot systems will require financial commitment on the part of the partner to test the engines, and to share the test data with Cool Energy.

4. **What is the cost of the SolarHeart Engine?**

We estimate the market cost of the 3kW engine to be \$8,000 - \$12,000 USD in production quantities of 1,000 per year.

5. **What engine sizes will be available?**

The engine size currently being tested is a 3kWe engine. A 20kW engine is currently being designed, and even larger engines are planned for the future.

6. **Will this system qualify for credits or incentives?**

Depending on the source of thermal energy, the system will qualify for a United States federal tax credit as high as 30%. Many states, cities and municipalities have other incentives. For a detailed list of incentives in the U.S., please refer to <http://www.dsireusa.org>. Many provinces in Canada, and countries in Europe have electricity generation incentives or 'feed-in tariffs'.

7. **How do I know if the SolarHeart Engine will work for my application?**

The SolarHeart Engine can be used with any heat source in the engine's optimal input temperature range of 100-300°C, and heat flow range of 40-150 liters/min.

TECHNOLOGY

1. **What is the Cool Energy technology?**

The system is based on the SolarHeart Engine which is a Stirling Engine (Invented in the early 1800's by Robert Stirling). The Stirling engine is a heat engine that operates by expansion and compression of air or other gas (called the working fluid), at different temperature levels such that there is a net conversion of heat energy to mechanical work. The Cool Energy SolarHeart uses nitrogen as the working fluid, and is driven by relatively low temperatures (100°C-300°C). The mechanical work generated drives a generator (built inside the engine) that creates electrical power.

2. **300°C is too hot for water. What is the heat transfer fluid in the SolarFlow System?**

The SolarFlow System uses a mineral-oil based, food-safe and non-toxic heat transfer fluid which is rated to 340°C.

3. **Does the SolarHeart Engine make noise?**

Because the SolarHeart operates at a low speed (600 rpm), has no internal explosions and is fully balanced the engine is extremely quiet and low in vibration.

4. **Is the SolarHeart reliable?**

The SolarHeart Engine is designed for a 70,000 hour maintenance-free life. There is no lubrication required as all bearings are sealed.

5. **How much heat and electricity can be generated?**

The chart below shows the modeled power output for given input temperature and flow rates. Testing is currently on-going to determine how well the 4th-generation engines match these development models.

Hot Side Input Temp (°C)	Oil Flow Rate (liters/min)	Electrical Output Power (W-dc)	Thermal to Electrical Conversion Efficiency (%)
100° C	40	579	6.4%
100° C	75	639	7.0%
100° C	110	658	7.2%
100° C	150	667	7.3%
150° C	40	1288	12.9%
150° C	75	1345	13.4%
150° C	110	1362	13.6%
150° C	150	1370	13.7%
200° C	40	1911	17.8%
200° C	75	1965	18.3%
200° C	110	1981	18.4%
200° C	150	1989	18.4%
250° C	40	2462	21.6%
250° C	75	2512	22.0%
250° C	110	2527	22.1%
250° C	150	2534	22.1%
300° C	40	2954	24.6%
300° C	75	3000	24.9%
300° C	110	3014	25.0%
300° C	150	3020	25.0%

BUSINESS

1. **What type of business is Cool Energy?**

Cool Energy is a privately held corporation, based in Boulder, Colorado.

2. **How is Cool Energy funded?**

To date, Cool Energy has been backed primarily by angel and venture capital investment and has received several SBIR grants from the National Science Foundation and the Environmental Protection Agency, as well as a Department of Energy subcontract and a Colorado Governor’s Energy Office grant. Cool Energy is currently raising its Series B round of capital for the purposes of beginning volume manufacturing.