Green conversion of heat to electricity

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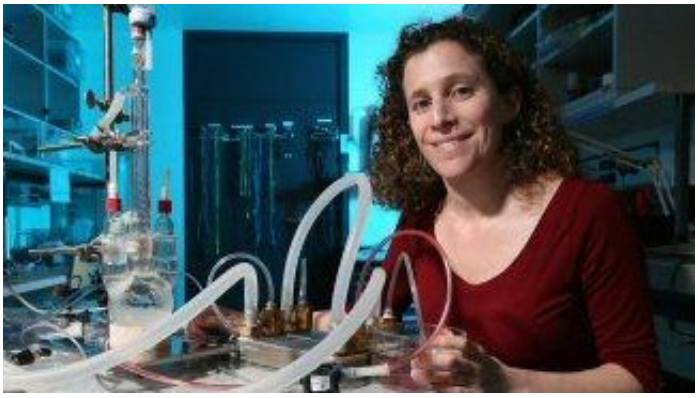

Credit: 2013 Alain Herzog

Soon, it will be possible to produce electricity from heat over 30 degrees emitted from a waste incinerator, refinery, or data processor. The start-up Osmoblue has just confirmed the feasibility of this new concept.

A large proportion of the energy consumed – between 20% to 50%, according to some studies – is dispersed as heat. Although it is already possible to recycle heat at temperatures over 150 degrees to produce electricity or to heat homes, the rest is simply released into the environment. At a time when companies are forced to be concerned with their environmental impact, this deficiency must be remedied. The start-up OsmoBlue, based in EPFL's Laboratory of Microsystems, developed a process based on the principle of osmosis to convert heat over 30 degrees into electricity.

Osmosis is a natural phenomenon that occurs when the concentration between two solutions separated by a membrane differs, for example between saltwater and freshwater. A stream flows from the less concentrated to the more concentrated solution, which tends to balance the concentrations on each side of the membrane. The mechanical energy of this stream may be converted into electrical energy by a turbine and an alternator. Heat is again used to separate the fluid into two separate solutions, one of which is more concentrated than the other. It is, therefore, a closed circuit (see image) that does not consume water. Though this concept has attracted significant investment, it has struggled to become a reality due to low yields.

The OsmoBlue technology is advantageous because it can be implemented with any heat source: air, water, gas, etc. The efficiency of the machine is both dependent on temperature and the nature of the hot and cold sources (air, water, gas, or steam). Connected on one side to the heat source and the other to the power grid, modular systems could eventually be installed in existing structures, near the company's cooling system.

With a team of seven people, the young entrepreneur has completed a digital laboratory demonstrator and a digital model for evaluating the performance of the product. "For example, it allowed us to estimate that 10 megawatts of heat could produce between 100 and 600 kilowatts of electricity, the consumption of one hundred homes."

It was during a postdoctoral fellowship at Harvard University in the United States that Elodie Dahan had the idea to revisit the method of osmosis. Components have been revised in light of recent advances in materials engineering and microtechnology. A first prototype is currently being manufactured at EPFL. A pilot unit on a larger scale could then be installed in a regional waste incineration company in 2014.

More information: www.osmoblue.com/

Provided by Ecole Polytechnique Federale de Lausanne