Start-up company aims to harness the full potential of producing electricity from waste heat

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A coal power plant in Datteln, Germany, that transforms chemical energy into 36%-48% electricity and the remaining 52%-64% into waste heat. Image credit: Arnold Paul. Wikimedia Commons.

(PhysOrg.com) -- Matt Scullin co-founded Alphabet Energy just one year ago, but already the CEO has ambitions of turning the San Francisco-based start-up company into the "Intel of waste heat." By harnessing the waste heat emitted by power plants, industrial furnaces, and cars, Alphabet Energy envisions that it could provide inexpensive electricity to the US grid by recycling waste heat on a much larger scale than currently exists.

Currently, more than two-thirds of the fuel used to generate power in the United States is lost as heat, according to a 2008 report from the Oak Ridge National Laboratory. The goal of cogeneration technology is to convert this waste heat into electric and thermal power. Although the idea has been around for more than a century, the US produces only about 9% of its power from cogeneration systems. In comparison, many European countries use cogeneration systems for a significantly larger portion of their electricity production, with Denmark producing more than 50% of its power using waste heat recovery systems. In the US, the Department of Energy has a goal for recycled waste heat to account for 20% of US electricity production by 2030.

Alphabet Energy's strength lies in its recent development of a thermoelectric chip that can be inserted into a wide variety of exhaust flues, engines, or other heat-producing devices to convert the waste heat into electricity. As heat essentially pushes electrons through the material, the device can be connected to the grid to feed in the electricity in real time. As the company explains, the device's key advantage is the novel material - a relatively abundant, low-cost material that has been modified by researchers at the Lawrence Berkeley National Laboratory to lower its thermal conductivity and increase its electricity output using a smaller amount of heat. Another advantage is that the thermoelectric chip is produced using similar methods used for producing the microchips used in electronic devices, which should lower production costs.

These improvements may allow Alphabet Energy to lower the cost of installing the system to less than half that of current systems, to under $1 per watt. At this cost, and depending on the properties of the heat generation system, the system could deliver a payback time of two to four years. In addition, since electricity generated from waste heat is 100% clean energy, Alphabet estimates that its technology will be able to offset more than 500 million tonnes of carbon annually.

Alphabet Energy plans on performing a pilot test at an industrial facility next year, and may start commercialization in 2012. One of the challenges the company faces is that waste heat is one of the few power sources that the US government does not currently subsidize. However, recently a bipartisan group of lawmakers led by Democratic Representative Paul Tonko of New York have introduced a bill that would offer a 30% tax credit for installing waste heat recovery systems in industrial environments.

Alphabet Energy estimates that the technology for waste heat recovery systems could comprise a $200 billion global market. Other US companies are also working on waste heat recovery techniques, from small start-ups to corporations including General Motors and General Electric. Besides heat from factories and power plants, future systems could also harness the heat from laptop computers and cell phones, although that technology is still in development.

More information: Alphabet Energy
via: National Geographic