RENEWABLE ENERGY • TECHNOLOGY

FREE POWER: HARNESS ELECTRICITY FROM A RIVER

Free Power: Harness Electricity From a River

Going off-grid has never been easier, especially if you live near a river. Just throw a Mobile Hydro Rotor into the water, and you can run a refrigerator, water pumps, a small computer or appliance 24 hours a day. What's more, the benefits to third world countries could be huge.

The Mobile Hydro, a simple, floating rubber ring made from recycled materials, with three rotors inside, is moored to a river bank and uses the natural swirling of the water to turn its blades. A generator captures the energy and transfers power back to the bank, where a battery and transformer kit awaits.

However, it's not just a great idea for camping trips to keep the drinks cool and the food fresh. The International Energy Agency (IEA) reports that 1.3 billion people worldwide have no access to electricity – and this major energy poverty crisis within the global energy system has its epicentre in sub-Saharan Africa.

In a special World Energy Outlook report last year, Maria van der Hoeven, Executive Director, IEA, said more than 620 million people in sub-Saharan Africa – around two-thirds of the total population – live without electricity.

"Only one country in the region – South Africa – consumes even as much electricity as London," she said. "In addition, nearly 730 million people in sub-Saharan Africa rely on hazardous, inefficient forms of cooking – using wood, charcoal, dung or agricultural residues as fuel in polluting cook stoves, and causing huge numbers of premature deaths each year."

Empowering people as well as their appliances

So the German team of engineers who invented the Rotor, Andreas Zeiselmair and his colleagues Markus Heinsdorff and Christoph Helf of the Social Entrepreneurship Initiative, Mobile Hydro, have bigger plans for their creation – empowering people as well as their appliances.

Electrical supply plays an important role in improving the living conditions and economic growth of developing communities. For lighting, supply of small loads, such as refrigerators and water pumps or charging of mobile phones, there is a very real basic need in all remote, rural areas of the world. Yet existing solutions to these problems are very expensive, due to high running costs and complicated high-tech machinery.

The German team says harnessing hydro energy has potential for these remote, low income communities in poorer parts of the world where on-grid energy is either not available or costs are too high. They estimate about one fourth of the 1.3 billion people living without electricity live near rivers, and even though small hydro, wave or tidal energy sources are still too expensive as a mainstream supply of power, these people could invest in a small Rotor, rather than importing fossil fuel from distant places for their generators.

The Rotor was developed, analysed and tested by Zeiselmair at the Hydromechanics-Laboratory under the supervision of Dr.-Ing. Christoph Rapp in 2011. The design was originally used for wind turbines and driven by lift force but also runs underwater. This vertical axis water wheel can produce electricity with an integrated dynamo/generator up to 2 kW, depending on flow velocity produced by the river.

Portable, continuous power for isolated areas

Although it doesn't offer huge energy potential, the Mobile Hydro is portable and provides continuous power, 24 hours a day, unlike some renewable energy sources that don't generate energy when the wind isn't blowing or the sun isn't shining. Without 24-hour power, daily life in remote communities in poorer areas like Sub Saharan Africa and Latin America is restricted and daily productive work just ends with sunset, Andreas Zeiselmair told a Falling Walls Conference last year in Berlin.

"It's (the Rotor) put in a river, fixed at the embankment on both sides or even only on one, and through the flowing water, the rotor turns in the middle and drives the generator which finally produces electricity," he told the Falling Walls Conference.

"We can feed it into a simple car battery; the whole system is kept really simple, and use it for different appliances, which can be light bulbs, charging mobile phones, TVs or small computers," he said. "Our goal is to set up a certain business, and to promote also local businesses which can use our product to give services...our goal in total is to empower people and to replace the diesel generators in use now."

Depending on the river flow, it takes about two and a half hours to recharge the battery.

"The main target is isolated areas without grid connections. In a few steps, local energy providers, small business holders, farmers, and households can produce electricity at minimum costs," Zeiselmair said.

This year, the team is carrying out pilot projects in Latin America, East Africa, and India. Their initiative was founded in 2013, and, based on the successful Empowering People Award of Siemens Foundation the team further developed their idea with the vision to substitute diesel generators through eco-friendly alternatives and the ambition to supply electricity to rural areas.

An award-winning initiative

Mobile Hydro was a national winner in the 2014 James Dyson Award. The design is not yet commercialised, but intellectual property was secured through registration of the design and technical concept. Market entry, including series production, is envisioned for this year, 2015.

In 2013, the Mobile Hydro won the German Recycling Design Award and successfully reached the awards stage of the finalists of the Empowering People Award of the Siemens Foundation in Nairobi, Kenya. In May 2014 the technology was successfully presented and

awarded with the Innovation Award of the European Small Hydropower Association (ESHA) in Istanbul, Turkey.

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