impact journalism day

Energy supplied by humanitarian kite

The Zéphyr project, a photovoltaic balloon designed by students, aims to supply energy to disaster areas

Caroline de Malet (Le Figaro)

In the Iliad, Zephyr is a violent, stormy wind, while in the Odyssey and more recent literature, it is depicted as gentle and light—a warm breeze that melts the snow. In this project set up by two ambitious young Parisian graduates, Zephyr takes the form of a flying device that comes to the rescue of those living without electricity in disaster areas.

In emergency situations, the question of energy supply is often of critical importance. At the moment, electricity in refugee camps generally comes from heavy, polluting generators that require expensive fuel oil. The supply chains for such oil can be broken, making procurement unpredictable.

These problems gave the students the idea of designing a photovoltaic balloon inspired by inflatable balloons, which can generate energy anywhere—even in disaster areas where it is not possible to install land-based infrastructure as a result, for example, of a natural catastrophe. The students, graduates of Telecom ParisTech and the École Nationale Supérieure des Arts Décoratifs, met while working together from November 2013 to March 2014 on 'energies of the future' at the Laboratoire, a facility set up in Paris to bring together engineers and designers.

Energy for fifty people

The principle is based on a highly mobile, low-cost kit made up of a box housing the technology and a lightweight sail. The land-based housing contains an electrical transformer and is less than a cubic meter in volume, while the sail is 3.8 m in diameter and is covered with 15 m2 of lightweight solar panels. 'All you need to do is unfurl the sail and allow it to inflate. The balloon collects solar energy and transports it to the ground via a cable, while the batteries store surplus energy and take over the power supply at night,' explains Cédric Tomissi, one of the two young designers behind the project. The electrolyser uses nine litres of water plus the solar energy collected, coupled with the batteries inside the housing, to produce the gas needed to inflate Zéphyr in half a day. Halfway between a balloon and a kite, this hybrid device has a yield of up to 3 kilowatt hours (kWh), comparable to that of a traditional generator. This is enough to supply lighting and heating to around fifty people living, for example, in a refugee camp or emergency hospital.

The idea has not gone unnoticed. The young entrepreneurs have already won several awards, including the 2014 ArtScience prize, the 2014 James Dyson Award, first prize at the 2014 Student Entrepreneurship Day run by the Université Paris-Saclay, the 2014 Humanitech Challenge jointly organised by the Red Helmets Foundation and Orange and EDF's 'Sharing energy in the city, 2030' challenge. They were also given the opportunity to present their project at EDF's stand at the Saint-Étienne Design Biennale in March. 'It's a simple, environmentally friendly device,' explains Jonathan Bouzy, a project manager at Soft IQ and member of the Humanitech Challenge panel of judges. 'They are applying existing technology in a brand new way. That's what "high tech" is all about.'

A technical feasibility study was carried out on the balloon last November in partnership with EDF, Dassault Systèmes, the Red Helmets Foundation and the Institute of Research and Development on Photovoltaic Energy (IRDEP). The students worked particularly closely with the IRDEP to improve the balloon's photovoltaic technology. After one of the engineers who set up the project left the team to pursue other professional avenues, Zéphyr entered into a partnership with the EI-CESI engineering school, giving final-year Master's degree students the opportunity to work on technical aspects of the project.

From student project to start-up

The next stage is to build an initial prototype, which should be completed in January 2017 and will serve as 'proof of concept'. 'We think that we will need 25,000 euros to make it,' explains Julie Dautel, a designer who is currently studying at the Sciences-Po Paris research university. Zéphyr has already received around ten thousand euros from the various prizes that it has won and a fundraising campaign is planned to run from September 2015 to January 2016. The team hopes to use this investment to take on additional staff, particularly engineers. The two young entrepreneurs want to turn this student project into a start-up. Zéphyr is also currently applying to join the Sciences-Po Paris incubator.

The duo is aiming to move into an industrial phase and start selling the balloon in 2018. More investment (one million euros) will be required at this later stage. In the long term, the aim is to sell an entire range of balloons adapted to generate energy in different kinds of situations, including non-humanitarian applications. 'The balloon can be used for homes in remote areas where the roof cannot take the weight of traditional solar panels, at campsites and in nomadic encampments like those found in Africa and Asia. It can even be used to support communications technology,' explains Julie Dautel. For now, it will be some time before Zéphyr is ready to take to the air.

This photovoltaic balloon is capable of generating energy in disaster areas where it is not possible to install land-based infrastructure.

Solid Rain

Claudia Villanueva

Water scarcity continues to increase around the world. According to the United Nations some 700 million people in 43 countries suffer this acute shortage caused by overexploitation of water resources and the irrigation of agricultural lands to enhance production when rainfall is scarce.

In 2006 the United Nations announced its International Decade for Action 'Water for Life' 2005-2015. The UN predicts that 1.8 billion people will be living in countries or regions with "absolute water scarcity" by the year 2025. The challenge they identified is for the distribution of water resources in a responsible way, because almost half the world's population will be living in areas of high water stress by 2030, including between 75 million and 250 million people in Africa.

But a few years before the publication of the 2006 Human Development Report by the United Nations Development Program and of the report "Coping with Water Scarcity. Challenge of the Twenty-First Century. UN-Water", by the FAO in 2007, a Mexican scientist Sergio Jesús Rico Velasco from the Instituto Politécnico Nacional invented "Solid Rain" and founded the company "Silos de Agua" in 2002 to commercialize his product.

Slowly but steadily the news of his invention reached the world, opening a new window of hope for many countries around the world, including Russia, India, Ivory Coast, Colombia, Spain, Portugal, Chile, Peru and, of course Mexico; which began to experiment with the new product to ease water shortages for agriculture. In 2012 Rico Velasco was nominated for the World Water Prize. The magic of "solid rain", a compound based on potassium acrylate, is that it can store 300 times, even 500 times its own weight in water without causing any harm to the environment, nor triggering toxic chemical reactions regardless of the type of soil substrate.

The product looks like a white powder sugar but is made of ultra-absorbent potassium polyacrylate which Rico Velasco and other scientists call "water silos".

So as an alternative to reducing water resources, this product stores rainwater and has the advantage that it can be kept anywhere, even in burlap sacks because the rain water molecules adhere to the potassium polyacrylate, which allows the gelatinization of the rain in the agricultural fields.

How does it work? Solid Rain encapsulates and disperses water during its lifetime, ranging from 8 to 10 years, it helps to aerate the soil, and permits agriculture in extreme climates and places with poor soil conditions. The ideal usage proportion is four "silos", each one containing the equivalent of one litre of water. The comparative cost is minimal because the "powder" sufficient for one hectare has a price tag of around one thousand dollars.

Rico Velasco explained that this technology can be used in all kinds of soil substrates and with all kinds of plants because it produces no chemical reactions with pesticides nor fertilizers because "it's just water" and it does not generate pollution.

The Solid Rain can regularly provide enough water to plants over a period of ten years maximum, while avoiding water stress and evaporation. Moreover, the solid rain particles can be rehydrated with each agricultural cycle. How is it used? Farmers need to take a spoon and mix 20 grams of Solid Rain with one liter of water, then mix it into the soil. Then plant theirs seeds and mix it in with the soil of other plants (www.solid-rain.com).

According to Solid Rain Corporation from San Diego, California, the product is capable of saving between 50 to 80 per cent of water, depending on the climate and soil conditions and from 30 to 50 percent of water usage in greenhouses.

Bagging the sun's energy

Reabestwe Mashigo

Reabetswe Ngwane and Thato Kgatlhanye with their ingenious invention

Reabetswe Ngwane and business partner Thato Kgatlhanye personify the buzzphrase social entrepreneurship. They have designed schoolbags, through their company Rethaka, that do more than carry books—they help children read them too.

Rethaka recycles plastic bags—easy to come by across the South African landscape—turning them into school bags which have built in solar power packs. These packs are charged all day in the sunlight while the children are at school, and are fully charged when the sun goes down providing much need light for doing homework. Thato Kgatlhanye came up with the idea and unsurprisingly the young woman was named first runner up at last year's (2014) Anzhisha Prize. The prize, now in its fifth year, awards young entrepreneurs from Africa.

"We currently have eight employees who are responsible for the entire process from the collection, washing and sorting of the plastic bags, through to the final stitching and delivery of the Repurpose Schoolbags," said Ngwane.

Even for those who are lucky enough to never have a shortage of lights, perhaps this is a way for anyone anywhere to conserve energy—after all sunlight is free and clean—the buzzwords of the future of energy globally.