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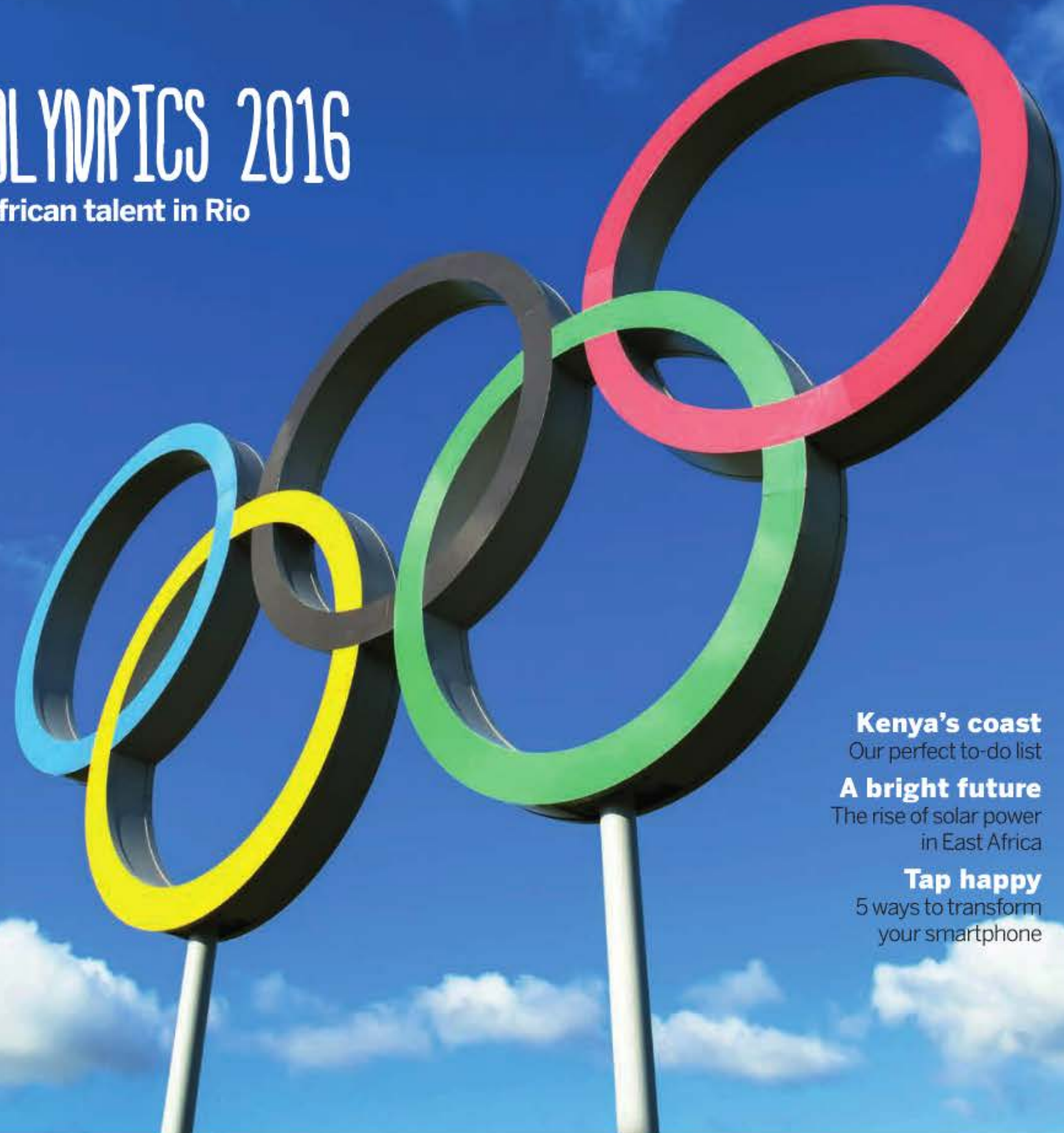
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OLYMPICS 2016

African talent in Rio



Kenya's coast

Our perfect to-do list

A bright future

The rise of solar power
in East Africa

Tap happy

5 ways to transform
your smartphone

Connecting Africa to the world



A bright future

The solar power industry is taking off in East Africa, which is good news for our pockets as well as for the planet...▶

WORDS: GUY LAWRENCE,
DIRECTOR FOR SOLARCENTURY IN EAST AFRICA

Technology Solar Power

Solar projects are springing up in every corner of the globe, and it's no surprise as this renewable energy technology has now proven itself at all scales. From solar-powered calculators to solar parks with thousands of solar panels, solar can generate electricity in a wide variety of applications. Even the largest oil companies agree that power captured from the sun is the world's fastest growing source of energy. Research shows that the world's growing fleet of solar panels generated a third more electricity in 2015 than a year earlier.

As solar proliferates, more and more people are now waking up to the power of the sun in order to generate electricity independently. Especially for off-grid systems, solar is democratising energy and making energy more accessible for all: solar is giving power to the people!

In East Africa, rows of solar panels mounted on the ground, on roof spaces and even on carports, are helping to reduce reliance on energy from the grid. These commercial scale systems reduce energy costs in manufacturing, mining and retail. Consuming solar electricity during the day means less energy is used from the grid, and this results in attractive cost savings.

Power-hungry East Africa

Quite simply, East Africa needs power, and to be specific, it needs more consistent, reliable sources of power. Relying on diesel generators is financially and environmentally unsustainable, even if they are only used for backup. Bright sun and falling solar prices make it competitive with the grid.

National energy infrastructure needs investment to turn it into a modern network capable of supplying enough energy to meet demand; and new sources of supply need to be found. But the engineering challenge is on a continental scale. It is clear East Africa needs new energy solutions, and fast.

With renewable energy, those solutions are here already. Companies no longer have to wait for upgrades to the electricity system to provide more reliable power. Businesses are also now purchasing solar panels and combining them with energy storage to provide more

reliable, more locally sourced and lower cost energy than an intermittent grid or a diesel generator can provide.

Businesses are also waking up to the possibilities afforded by a decentralised energy network, with wind and solar photovoltaic (PV) systems feeding clean energy into the grid. They recognise that this set up allows for far more flexibility than relying on a handful of large power plants.

Aside from the need for consistent power, countries are of course looking to move away from fossil fuels because of the now well-documented negative impacts of carbon on the environment. Factories and cars belching out fumes containing carbon and other greenhouse gases pose a huge health risk, and they're major contributors to our changing climate.

This spurred about 175 countries to sign up to the Paris Climate Agreement in December 2015. The agreement seeks to avoid catastrophic climate change by limiting warming

to 1.5°C to 2°C. Governments committed to replace fossil fuels almost entirely by clean energy in the second half of this century. East Africa can set an example to the world in how development can be accelerated using cheap renewable energy to support business.

East Africa's energy demand is already met by a mix of alternative energy sources, including hydropower, geothermal and biomass, all of which emit far less climate-changing carbon than fossil fuels. Solar uptake is increasing too in the region: small domestic systems on roofs are powering homes after dark, and much larger multi-megawatt systems on the ground or on factory roofs are supplying solar energy to businesses, thereby offsetting the need for grid energy during the day. These solar systems also feed

energy into the grid, helping to diversify Kenya's energy mix.

Innovations in solar technology are advancing rapidly, with solar integrated in increasingly novel ways; for example, the solar carport on the roof of Nairobi's Garden City Mall built by Solarcentury, which was connected last September. As well as providing shade for 454 car parking spaces, the system enables the Mall to be powered completely by solar electricity during daylight hours.

Harness the sun

It is often said that East African countries enjoy a favourable location for generating solar energy thanks to lengthy daylight hours throughout the year. However, ►

DID YOU KNOW?

Famous inventor and entrepreneur **Thomas Edison**, who invented the light bulb, foresaw the possibility for solar energy as far back as 1931 when he commented, "I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that."



City energy solutions: parking under a solar carport



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what is often overlooked are the social and technological reasons why solar is so well suited to the region.

Developments along the entire solar supply chain present us today with an energy generation technology that is easy to install, low maintenance and reliable. Solar can be deployed faster than any other type of low carbon technology, costs keep falling and efficiencies improving, so investors get ever more bang for their buck. It's little wonder that businesses are deploying solar: it's the fastest way to lower energy bills, reduce reliance on the grid, and ensure a consistent supply of power during the day.

In areas where there is no grid power available, small scale and portable solar technology devices can be used to bring light, communications and even entertainment to the remotest of places. These are available from reputable organisations such as SunnyMoney, the social enterprise run by international charity SolarAid.

Socially, solar is well suited to East Africa because it is a move away from a dependency culture on large centralised sources of power. Solar systems can be located close to where the energy is consumed, and it is a reliable source of power during daylight hours.

Beyond the solar home system

The increasingly favourable economic picture for solar has spurred a number of firms in Kenya to install solar, with the aim of reducing running costs and to enhance competitiveness. Williamson Tea in Changoi is enjoying energy bills around 30% lower every year, thanks to its 1MWp solar farm. The system was installed two years ago and will operate for at least the next 25 years, which underscores a key feature of solar: it's there for the long haul! With no moving parts, no smell and no noise, solar is low maintenance – so no technological baggage to deal with either.

Solar storage

When the grid fails, businesses want immediate and seamless backup power. Adding storage to your solar system gives instant and reliable backup and reduces reliance on expensive diesel generators. In short, solar with energy storage makes total dependence on diesel generators obsolete for business.

The International Energy Agency (IEA) has predicted that solar energy could be the top source of electricity by 2050, generating up to 16% of the world's electricity – the plummeting costs of the equipment to generate it is a key reason for this. Yet with storage added to solar systems, it's possible that it could be a far greater percentage than this.

The benefits of solar tied with storage are being realised around the world, with mines, utilities and homeowners adopting these systems.

In Germany, 35,000 German homes are reported to ▶

CASE STUDY WILLIAMSON TEA FARM, CHANGOI

One of East Africa's largest private solar farms

► The starting-point

Williamson Tea is a forward thinking tea producer, and publicly listed company, committed to sustainable farming and creating a greener future for tea production. The business was looking at cost-effective and reliable ways to secure its energy requirements at its tea farm in Changoi, Kenya. As with many businesses in Kenya there is a high dependence on expensive and dirty diesel generators.

The cost of energy from solar PV systems is generally US\$0.10-0.15/kWh, depending on finance costs, radiation and size of the solar energy system.

► The solution

Williamson Tea commissioned Solarcentury to design, supply and install a solar PV system at its Changoi farm. This large-scale solar PV system is designed to operate in parallel with diesel generators, which acts as a backup power source if required. This kind of system is known as a solar hybrid system.

► The construction challenges

Operating solar PV plants alongside diesel generators presents a number of challenges, including how to determine the best way to finance the investment and how to operate solar PV and generators together.



Solarcentury's solar PV system at Changoi Farm (Williamson tea estate)



Utilising solar hybrid technology means that solar PV systems can run alongside diesel generators and (potentially) energy storage.

► The result

The solar PV system provides approximately 30% of the factory's electricity needs. When the national grid is working, the solar power system works in parallel with the grid and reduces the amount of grid electricity imported. When the grid is down, the solar power system works together with the backup diesel generators, significantly reducing the amount of diesel consumed. This solar hybrid design means that the system can operate in parallel with a standby generator, which enables a stable power supply.

► The response

Alan Carmichael, Managing Director at Williamson Tea, said: "With more than 60 years' experience farming tea in Kenya, we really understand the need to protect our fragile environment. Investing in solar PV means we can harness Kenya's plentiful irradiance to run our operations on solar electricity, enabling a massive reduction in energy use and carbon footprint.

"Our substantial solar investment is evidence of our commitment to Kenya, and it will assist us in continuing to support local farmers and communities in the future. We are pleased to have worked alongside local companies to bring the benefits of solar energy to our Changoi farm."

Power and payback

Estimations only, correct at time of installation:

System size: **1 MWp**

Annual generation: **1.6 million kWh**

CO² savings per year: **1200 tonnes**

Storage arrives in **East Africa**

Technology Solar Power

have a battery system tied with solar on the roof. In 2015, half the small solar PV plants installed in Germany were built with storage.

Australia is also seen as an ideal market for solar and storage, with around 1.5 million, or 15 percent, of households already equipped with rooftop solar. Morgan Stanley estimated in a 2015 report that battery storage installations in Australia could soar to a million by 2020.

In 2015, the world spent more than twice as much on building new renewable energy plants than on new coal and gas-fired power stations. The additional renewable capacity added globally was equivalent to the entire generation capacity on the whole African continent! The US energy storage market grew by 127%.

Storage has historically been considered too expensive or too short lived. However, a mass market for reliable batteries has been created by mobile phones, consumer electronics and electric vehicles. These technological developments are also spreading to the power industry, and storage products (from Tesla's Powerwall to utility-scale battery storage) are increasingly common, and are evolving quickly.

Technology has dramatically improved from what most readers will be familiar with. The batteries in our phones last two to three years. Batteries for utility scale systems can be warrantied for 10 years, with some cycled nearly 100,000 times. Storage technology is mature and fit for market adoption and it is now a misconception to say that "batteries do not last". This holds huge promise for businesses in East Africa, which can benefit from affordable, long-lasting and reliable energy storage to reduce energy bills. The equatorial sun is a gift in this region!

To understand storage is to understand its flexibility. It means more solar energy can be installed while

simultaneously allowing diesel generators to be switched off, or run more efficiently. However, storage installations require precise professional design, agnostic technology selection and high quality construction. Expertise is hard to come by.

Solar electricity lights up the night

We can look at this example to understand all the benefits of storage in East Africa. A customer in a remote area might experience power shortages for 50% of the year and several times a day. Without solar or storage, the customer will be

paying for that grid connection and to run a diesel generator if the grid fails – this hits the wallet hard, since diesel can be 2-3 times more expensive than grid electricity. Alternatively, the customer could invest in a solar system to meet daytime energy demand – but this doesn't help if there is a power outage at night. By adding solar with storage technology, the customer can install more solar than they can consume in the day, knowing that they can use excess solar electricity generated during the day, for consumption after dark.

Solar tied with storage can also save money by displacing more energy from the grid and the generator. A solar and diesel energy system could meet in the region of up to 30% of a site's energy needs from renewables,

which will certainly save a few Kenyan Shillings. However, tying a battery with such a system is even more beneficial because it means a much larger portion of the site's energy needs could be met by solar. Of course, as the cost of solar continues to fall (by an astounding 75% since 2009) and with the cost of storage projected to fall by around 50% in the next five years, the economic case for solar tied with storage becomes an even more compelling proposition.

DID YOU KNOW?

In a single hour, the sun transmits more energy to the earth's surface than the world uses in a year.

EVERY CLOUD HAS A SILVER LINING

It's true that the more light the panels receive, the more electricity they can generate. But they still work on cloudy days.

Solar systems powering Kenya (built by Solarcentury)

1MWp solar farm for **Williamson Tea in Changoi**

Solar carports on the roof of **Garden City Mall in Nairobi**, which is 858kWp

A solar carport and two solar roof installs (total 1154kWp) and battery storage for **icipe**, insect research centre headquartered in Nairobi, and a third for its campus on the shores of Lake Victoria

Almost 1MWp solar roof system for **London Distillers'** building in Athi River



Installing solar panels by Lake Kivu, DRC
BBOX

CASE STUDY **ICIPE, KENYA**

Solar and storage in Kenya

World-leading Kenyan insect research centre **icipe** has recently chosen to adopt solar PV, which will be underpinned by solar hybrid technology combined with battery storage to provide more reliable power. Two solar roof systems combined with a carport system will be built at the icipe Duduville Campus in Nairobi. The third solar roof system will be built at the icipe Thomas Odhiambo Campus, in western Kenya, which will be combined with battery storage.

Dr Segenet Kelemu, icipe Director General, said: "Through this project, icipe's goal is to create a sustainable energy supply and to reduce diesel fuel dependency by constructing solar photovoltaic power plants at its Duduville Campus

headquarters in Kasarani, Nairobi, and at the icipe Thomas Odhiambo Campus on the shores of Lake Victoria."

Solarcentury will install battery storage for backup when the grid fails. These will be carefully monitored online to maximise life and system functionality for the customer. Aside from this project, there is huge scope for larger batteries across Africa such as for solar systems at mines, industrial processing facilities and at a domestic level (with small home battery systems).

Lux Research predicts the global grid-scale storage market to be worth US\$114 billion by 2017 and Boston Consulting Group forecasts a US\$400 billion market by 2020. A significant part of this expanding market will comprise projects in Africa, where there are opportunities for storage due to high grid energy costs, unreliable grid networks and high reliance on diesel generators.

Through this project, icipe's goal is to create a sustainable energy supply and to reduce diesel fuel dependency by constructing solar photovoltaic power plants

DR SEGENET KELEMU, ICIPE DIRECTOR GENERAL ▶

PICK OF THE PRODUCTS

msafiri selects five of the best small solar energy gadgets for the home and for personal use

1 SOLAR LAMP & MOBILE PHONE CHARGER

SunnyMoney is the largest seller and distributor of high quality solar lights in Africa, where over 600 million people don't have access to electricity. Replacing kerosene or paraffin with portable, affordable solar lights saves money, enables more study time, improves health, makes a home safer and saves the environment from harmful black carbon.

► WWW.SUNNYMONEY.ORG/INDEX.PHP/SOLARLIGHTS/D-LITE-S2-4/

2 SOLAR PANELS FOR BACKPACKS

Collect power as you adventure with these portable, foldable and rugged solar panels for your pack. Hang the panel off your pack and collect the power of the sun while on the move. Ideal for charging up lights, tablets and phones.

► WWW.GOALZERO.COM/BACKPACKER-HIKER

Below:
Powertraveller – clever little gadgets for power on the go

Right:
Technician teaching family about TV use

Opposite:
Powertraveller gadgets can charge your devices anywhere



BBOXX

3 SOLAR WATER PUMPS

LORENTZ technology uses the power of the sun to pump water, sustaining and enhancing the lives of millions of people, their livestock and crops.

► WWW.LORENTZ.DE/

the ability to have a western energy experience off-the-grid and in rural areas.

► WWW.BBOXX.CO.UK/OUR-STORY/

4 SOLAR SYSTEM FOR THE HOME

BBOXX's innovative plug and play systems are easy to set up providing electricity to millions of homes – with a forecast to provide 20 million people with electricity by 2020. By satisfying the genuine energy needs of individuals and families from home lighting to phone charging, BBOXX helps the developing world to climb the energy ladder. With BBOXX products, customers have

5 PORTABLE SOLAR CHARGER

In the desert, on safari, up a mountain or simply on the move, the solargorilla portable solar charger gives your powergorilla juice anywhere under the sun. Solargorilla is also a viable charging option for netbooks under 40 watts and it can even charge your mobile phone, iPod, handheld games consoles and many more devices from the 5V USB output.

► WWW.POWERTRAVELLER.COM/EN/SHOP/PORTABLE-CHARGERS/

About Solarcentury

Solarcentury is in business for a purpose: to make a meaningful difference in the fight against climate change. Solarcentury is present in nine countries globally, and this expansion is part of Solarcentury's ambition to make solar accessible for all. Solarcentury has been active in the region from the Nairobi office since June 2013.



Solarcentury in East Africa combines Solarcentury's British engineering excellence and experience of delivering, operating and maintaining solar installations at a commercial scale. Guy Lawrence, former CEO of East African Solar, brings local industry experience and insight. Lawrence, a successful entrepreneur, was responsible for delivering Kenya's first commercial solar system and is a regular commentator on solar, with international energy sector experience. 

