

GPM Vendor Landscape – East Africa May 2013



Introduction

The Green Power for Mobile (GPM) programme was launched in September 2008 by the GSMA Mobile for Development in partnership with International Finance Corporation (IFC) and with the support from the government of the Netherlands.

Since its inception, GPM has been focused on promoting green power technologies such as solar, wind, biomass, as alternatives for powering the telecom base station network in a sustainable manner with positive economic and environmental benefits.

In mid-2012, the GPM has started Africa-specific programme activities and embarked on a new set of objectives, specific to the African market, in an effort to further catalyse adoption of green power to reduce the dependence on diesel power by telecom operators and tower companies.

Besides the on-going technical engagement with the operators and tower companies, the goal of the Africa-specific programme is to research and assess the potential for green power in the key focus markets as well as to develop the eco-system through various initiatives including region-specific green vendor catalogues and best practice procurement guides.

The purpose of this vendor landscape document is to support mobile operators in their green power initiatives by providing them with a directory of brief profiles of green power vendors/service providers operating or having focus in the East African region. The document also provides a highlight of the current market snapshot including powering scenario and green power adoption in the three East African countries.

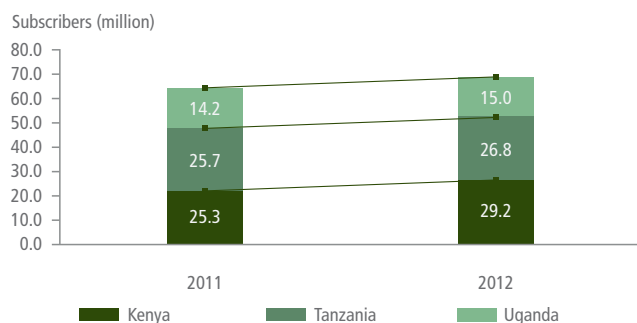
Market Overview

The Green Power for Mobile has recently published a market analysis report looking at various aspects of powering the telecom networks in Kenya, Tanzania and Uganda. Below are some of the key findings and insights from the report.

Telecoms Market

- **Mobile Subscribers:** Overall ~71 million mobile subscribers across Kenya, Tanzania and Uganda.¹
- **Mobile penetration:** Overall 58% of the population across Kenya, Tanzania and Uganda uses mobile services. Uganda has the lowest mobile penetration levels at 43%.¹
- **Mobile network coverage:** 80% of the population and 50% of the land area are covered by mobile signal; 96% of the uncovered population is rural.¹

Figure 1: Mobile Subscribers and Growth



Source: East Africa GPM Market Analysis report 2012

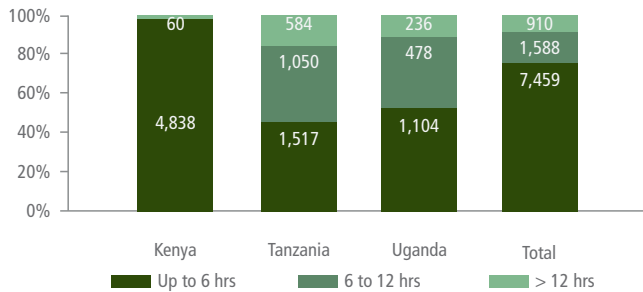
Mobile Network and Power infrastructure

- **Network size:** A total of 13,225 telecom tower sites across three countries (Kenya - 5565, Tanzania - 4593 and Uganda 3067 sites). The size of the network is to grow to 22,317 sites by 2015.¹
- **Off-grid network:** A total of 3,268 sites are located in areas without electricity grid infrastructure and are primarily powered by diesel generators. The off-grid sites are estimated to grow to over 5,300 by 2015.¹
- **Unreliable grid:** More than 25% of the total 9,957 on-grid sites have unreliable grid power supply with power outages of more than 6 hours a day.¹

¹ East Africa GPM Market Analysis report 2012

Market Overview

Figure 2: Sites by Power Outage (On-grid)



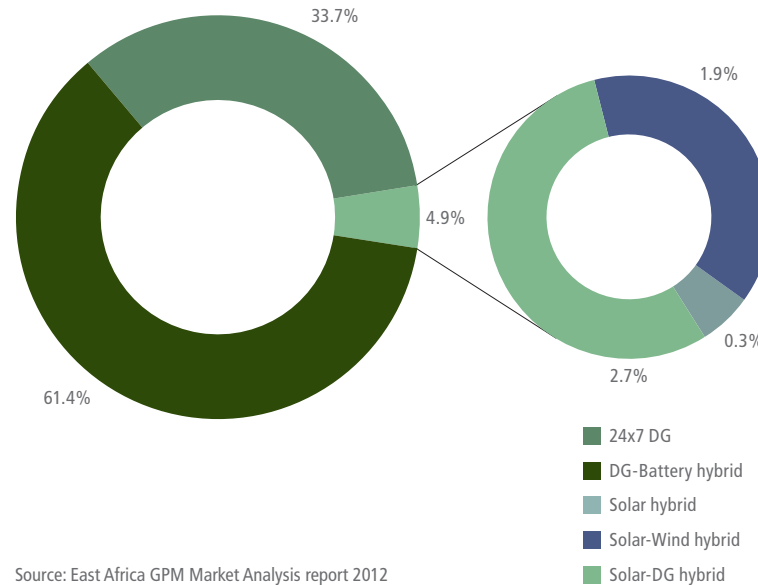
Source: East Africa GPM Market Analysis report 2012

■ Diesel power and OPEX.

- Approx. 34% of the off-grid sites are currently powered by 24x7 diesel.¹
- On an average around 1100 litres of diesel consumed every month at an off-grid site.¹

■ Only 5% of the off-grid sites are implemented with green power alternatives.¹

Figure 3: Power Solution Deployed (off-grid) - Green Power Break-up



Source: East Africa GPM Market Analysis report 2012

Tower Sharing and Energy Outsourcing

- Tower sharing is at the initial stage of adoption in East Africa with the entry of tower companies including Helios Towers Africa, Eaton Towers and American Tower Company.
- The energy outsourcing model is in pilot stage in East Africa and is expected to gain adoption once the model is proven in the local context.

Market Overview

Technology and Deployment Models

- The MNOs and tower companies are more inclined towards the CAPEX model for green deployments with partners for operations and maintenance of equipment.
- The OPEX based energy outsourcing model is yet to gain relevance due to the lack of vendors with proven business models and results.
- Solar PV technology is the dominant choice for green power deployments in the region.

Vendor/ESCO Landscape

Despite a good potential for green power adoption in the telecoms market in East Africa, a very small number of sites are deployed with green power. In East Africa, Kenya, Tanzania and Uganda combined, present an opportunity for over 4,000 green power deployment sites. The availability of technology and partners is very critical to scale the adoption of green power in the telecoms industry.

GPM lists down profiles of the vendors and service providers received from across local and global organizations that have focus in the East African region. The profiles have been categorized based on the type of product or service offered to the mobile operators and tower companies in the region.

The East African market is in need of vendors who can offer attractive and flexible but reliable green power sources. The current list shows a wide range of different vendors active in the East African market. However, we are yet to see scaled deployments. Due to CAPEX barriers, a lot of the deployments are stopped after trial and having OPEX partners may overcome the CAPEX barrier. To date efforts are still needed to deploy serious OPEX based Energy Service Companies in East Africa.

Table 1: East Africa GPM Vendor/ESCO Landscape

Company	Core Competencies	Company	Core Competencies
Ameresco Solar	Solar	Northstar	Storage
Apollo Solar	Solar	Novergy	Solar
Applied Solar Technologies	System Integrator	Off:Grid Electric	System Integrator/ESCO
Ballard	Fuel Cell	Orun Energy	System Integrator/ESCO
Clean Power Systems	Solutions	Pamoja Cleantech	System Integrator/ESCO
Eltek	Power Equipment	Phaesun	Solar
Emerson Network Power	Power Equipment	PNN	System Integrator/ESCO
Ericsson	Telecom Equipment	Power One	Power Equipment
Evance	Wind	PowerOasis	System Integrator
Flexenclosure	System Integrator	Saft	Storage
GE Storage	Storage	Urban Green energy	System Integrator
Gildemeister Energy	Storage	WindGen	System Integrator
HelioCentris	System Integrator	Zephyr	Wind Turbine
Huawei	Telecom Equipment	ZTE	Telecom Equipment
Hybrid Energy	System Integrator		

Contents

Company	Page		Page
Ameresco Solar	7	NorthStar Battery	22
Apollo Solar	8	Novergy Energy Solution Pvt. Ltd.	23
Applied Solar Technology (AST)	9	Off.Grid:Electric	24
Ballard Power Systems	10	Orun Energy Ltd.	25
Clean Power Systems	11	Pamoja Cleantech	26
Eltek	12	Phaesun France SAS	27
Emerson Network Power	13	PNN Group	28
Ericsson	14	PowerOasis	29
E Vance Wind Turbines	15	Power-One	30
Flexenclosure	16	SAFT	31
GE Energy Storage	17	Urban Green Energy	32
Gildemeister Energy Solutions	18	WindGen Power East Africa	33
Heliocentris Industry GmbH	19	Zephyr Corporation	34
Huawei Hybrid Power	20	ZTE Power	35
Hybrid Energy Solutions Limited	21	Index	36

Ameresco Solar

Company Background

Ameresco Solar is the world's most experienced off grid and poor grid renewable energy solutions provider, whose core personnel have collectively 300+ years global experience in the design, engineering and project management of solar, hybrid and cycle charge power systems, with many working in the industry for over 20 years.

Client List

Angola Telecom	Wataniya Maldives
Tigo DRC	Telesur Surinam
Indosat Indonesia	AT&T USA
Telkomsel	Tigo Guatemala
Mobitel Cambodia	Verizon USA

"Ameresco Solar has supplied multiple photovoltaic and hybrid power systems to QTEL Group OPCOs. Their engineering knowledge and experience of the renewable power systems are commendable and their after sales support to the Group has been excellent so far. We look forward to continue working with Ameresco Solar."

Qtel International



AMERESCO SOLAR
Green • Clean • Sustainable

With tens of thousands of successful installations worldwide since the 1980's, ranging from simple standalone solar systems to complex hybrid power solutions with extensive remote monitoring and control capabilities, our experience in providing reliable and economically feasible renewable power solutions for the global telecom industry is unsurpassed. Ameresco Solar power solutions offer the network operator a strategy to significantly lower OPEX while providing a quick return on investment (ROI).

Product and Services

Renewable energy power solutions are offered to the global telecom industry including standalone solar, solar/diesel hybrid, solar/diesel/wind hybrid, solar/fuel cell hybrid, and cycle charge (CDC) system solutions.

Our services include the design, engineering, integration, installation, and training of solar, hybrid and cycle charge power solutions for sites without access to the utility grid, access to poor utility grid, as well as retrofitting existing telecom sites operating primarily off diesel generators, resulting in significantly lower OPEX.

Geographic Footprint

Worldwide: Africa, Asia, SE Asia, Middle East, Americas.

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Green Power
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Apollo Solar



Company Background

Apollo Solar provides the total power solution for pure solar or hybrid solar/diesel systems including Real Time Remote Monitoring. We make the complete Power System for any size off-grid Telecom tower. Apollo is the primary source for the hardware and software which allows us to offer Service Level Agreements to keep your systems running.



Beginning in 1971, the Apollo team at Apollo Solar established a reputation for reliable power electronics. Today Apollo Solar is a leading supplier of solar power electronics to the telecom industry, including Remote Monitoring. Apollo Telecom Systems, designed to meet the technical requirements of global telecom leaders are deployed on every continent. Telecom companies depend on Apollo for the performance and reliability in all environments. The highly regarded Apollo PV for Telecom (PVT) systems are made in the USA and available globally to Telecoms, Tower Operators, Energy Service Companies, Power Providers, and Solar Integrators worldwide.

supplies the benefits of optimized MPPT PV energy harvest, sophisticated thermal design for reliability, unique charging protocols for extending battery life, advanced lightning / surge protection, and integral real-time remote monitoring in IP66 cabinets sealed against water and dust. Instant alarm reports and charts showing history of all key parameters with detailed diagnostics result in maximum uptime, optimized system efficiency, and reduction in diesel fuel expense. System performance and alarm monitoring makes Apollo the only supplier providing the complete electronics solution from one source. Apollo PVT Systems solutions carry a standard 5-year warranty and Service Level Agreements with 24/7 monitoring, rapid on-site service, and warranty extensions are available.

Product and service description

Apollo Solar builds on the T80HV MPPT 80A High-Voltage Charge Controller, the 4kW TrueSineWave Inverter / Charger, Combiner Boxes, and all required circuit breakers and connectors to provide reduced-cost installation and operation of BTS and DAS Telecom sites. For 4.2kW to 33.6kW of PV input, Apollo

Geographic footprint

Apollo Systems are installed and operating on every continent.

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Applied Solar Technologies (AST)

Company Background

Applied Solar Technologies ("AST") is a green and renewable power solution company in India. During its last three years of operations AST has acquired expertise to design, deploy and operate green energy solutions based on solar PV and HFC for a range of off-grid applications in the telecom, oil, banking and community power sectors.

Client List

Bharti Infratel
Indus Tower
Idea



AST has deployed solar PV panels of more than 10MWp. Currently, AST provides off-grid solar power to telecom towers which commonly rely on diesel-based generation for 50 – 100% of their power requirements. AST builds and operates these solar installations and takes over the power supply management of each site. It uses a combination of solar PV, battery back-up and diesel generator making it a hybrid energy solution that optimizes the usage of various sources through a controller. The optimal usage of these sources results in decreased diesel consumption, increased battery life and reduced diesel generator maintenance and replacement costs resulting in savings for AST's consumers.

Product and services

We offer a complete range of services covering energy survey, solution design, supply, installation and power supply management for renewable hybrid energy systems based on solar PV and HFC for telecom towers, community power, petrol stations / GAS stations and bank ATMs.

Our solutions offer superior remote monitoring functionalities for efficient system control with our proprietary network management system providing solution performance information, data logging and alarm management.

Scale/Maturity of enterprise

- AST has installed and is managing solar hybrid passive power infrastructure at more than 2100 telecom towers, Gas stations and Bank ATMs.
- AST completed successful pilots of HFC on telecom tower sites and is preparing for commercial deployment.

Geographic footprint

Currently in India – Bihar, UPE, UPW and MP states. Plan to expand to Africa and ASEAN countries.

"Applied Solar Technologies India Pvt Ltd. (AST) introduced its 'Hybrid Solar Power Systems' in India in August 2009. Solar solutions for tower sites were conceptualised by Infratel and Solar DG hybrid model was co-developed by Infratel & AST and it was 1st implemented at 500 Infratel sites in Bihar (India) by AST. After successful implementation, this model was accepted by the entire telecom tower industry in Bihar, UP East and UP West states."

Bharti Infratel

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Green Power
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Ballard Power Systems

Company Background

Headquartered in Burnaby, British Columbia, Ballard Power Systems Inc. (TSX: BLD; NASDAQ: BLDP) provides clean energy fuel cell products enabling optimized power solutions for a range of applications. We are recognized as the world leader in design, development and manufacture of zero-emission proton exchange membrane (PEM) fuel cells and are focused on accelerating commercial adoption. Ballard's products and solutions deliver tangible improvements over incumbent technologies across a range of stationary power and motive power applications.



Ballard ElectraGen™- ME Fuel Cell System for Backup Power



In addition to delivering improved business results for system integrators, OEMs and end-users alike, our fuel cell products afford major environmental benefits. With our proven technology, comprehensive range of fuel cell products and services, unsurpassed field experience and teams of highly-skilled people we have what it takes to create smarter solutions for a clean energy future.

Product and service description

For telecom service providers, power outages can be devastating. Fuel cell backup power solutions for telecom offer numerous compelling advantages over conventional lead-acid battery and diesel generators in backup power applications.

Ballard offers a comprehensive portfolio of backup power systems, scalable from 2kW and up, to meet a range of application requirements.

Ballard's fuel cell systems for backup power are designed for high reliability, long life, minimal maintenance and provide extended runtime at an attractive lifecycle cost.

The ElectraGen™ family of fuel cell power generation systems, fuelled by either methanol or compressed hydrogen, provides backup power for both 'short duration runtime' and 'extended duration runtime' requirements. Ballard's ElectraGen™ systems offer proven financial and environmental advantages in comparison to lead acid batteries and diesel generators.

Ballard and our global network of partners provide complete, proven solutions that can be implemented rapidly and easily, providing end-to-end support for a range of application requirements.

Geographic footprint

North America, Europe, Africa, India, China, Indonesia, Japan, and Australia.

Client List

China Mobile	Nokia Siemens Networks	PT Hutchison	Vodacom
Idea Cellular	Orange	CP Telecommunications	Wind Mobile
Motorola	SINE Network	Telstra	

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"Integrating fuel cells with our base stations can significantly increase the resilience of the mobile networks we provide."

Nokia Siemens Networks



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Clean Power Systems

Company Background

Clean Power Systems ("CPS") was established to address the diesel consuming power issues within the mobile network infrastructure space. Unlike traditional renewable product companies, CPS systems, including delivery, installation and maintenance, typically provide payback periods of less than 1 year based on the extremely inefficient and highly pollutant nature of the power systems within the markets we serve.

Client List

- All Major Tower Leasing Co's in Africa
- Telecom operators customer's are not public information – confidential until officially authorized for release of information
- LeBLANC Group

Company

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CPS provides end-to-end power solutions that dramatically reduce diesel generator runtimes, diesel fuel consumption and overall operating expenses for mobile network operator ("MNO") tower sites in developing markets where power is unreliable or unavailable.

The technology has been proven and tested in CPS core markets of Middle East & Africa. CPS provides system audits, designs, equipment, delivery, installation and ongoing support services for all of its solutions

Product and Services

Our systems are engineered to the highest levels of quality and performance and have been proven on 1,000's of site deployments in the most challenging power environments.

CPS Solutions serve 2 primary types of sites:

- **Off-grid sites** where diesel generators are primary source of power, running 24/7
- **Poor-grid sites** where grid power fluctuates in voltage or has phase failures, causing the diesel generator to power the site

CPS SolSite Systems provide solutions with total OPEX savings in excess of 70%

- SolSite Hybrid Generator/Battery Platform for off-grid sites
- SolSite Line Conditioning Platform for poor-grid sites
- SolSite Renewable Platforms for solar/PV & Wind turbines

All SolSite Systems:

- Renewable Ready for upgrades to Solar or Wind at any time
- Include our Remote Monitoring & Management System: "SolSite Manager"
- Full System Performance Monitoring & Management System

Financing

OPEX financing models are available through our banking partners.

Geographic Footprint

Africa: Kenya, Uganda, Tanzania, Sudan, South Africa, Namibia, Ghana, Burundi, Congo, DRC, Niger, Mali, Gabon, Senegal, Mauritius

Middle East: UAE, Saudi Arabia, Pakistan, Afghanistan, Iraq, Egypt

Latin America: Bolivia, Panama, Costa Rica, Peru, Argentina, Brasil, Chile, Ecuador, Colombia, Haiti

Asia Pacific: Malaysia, Indonesia, Australia

Europe: Spain, UK, Czech Rep



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Eltek

Company Background

Eltek is a high efficiency power electronics expert with more than 40 year experience with DC power systems for the telecom infrastructure. With a revenue of USD 565 million we are number 2 in the market in terms of revenue, but stands out as the technology leader with a drive towards energy efficiency and OPEX saving.

Eltek is a truly global company with more than 2200 employees worldwide, located in more than 30 facilities and delivering to more than 100 countries.

Client List

Viettel	GrameenPhone
Beeline	Indosat
Millicom	Maxis
China Telecom	Globe Telecom
Etisalat	Vodafone



Since launching the Flatpack 2 HE (High Efficiency) series of rectifiers, more than 200,000 (Jan 2011) have been installed, demonstrating an impressive field performance. Our telecom heritage together with an intensive focus on renewable energy has put us in a position to create hybrid solutions that are unmatched with regards to efficiency, system power density and level of integration – all 100% according to Telecom standards and expectations.

Product Description

ELTEK'S pure solar and hybrid power solutions are based on industry-leading building blocks, fully integrated into coherent, complete and flexible solutions – with one single controller overlooking all energy sources, flow and storage. The entire installation is easily and efficiently monitored and controlled over the Internet by means of advanced, yet user friendly monitoring software, with relevant system data fed from the Smartpack controller which at all times oversees critical parameters and general system performance.

With the market leading High Efficiency (HE) technology the solution from ELTEK is maximizing the contribution of the renewables without compromising telecom specifications. When a diesel generator is part of the solution advanced monitoring and control maximizes its energy output as well. All modules including solar converters and wind converters have galvanic isolation, separating any input from the telecom load. In the solution one single controller controls all the passives.

Finance: Our financial structuring experience enables operators to acquire full solutions with no upfront capital expenditure, instead paying from savings generated or increased income. We structure transactions to suit the individual cash flow and budgetary requirements of our clients. We can demonstrate a positive ROI from Day 1.

Geographic Footprint

Worldwide.

“Vodafone Greece collaborates with Eltek to implement hybrid operation at the majority of rural sites operating continuous generators. The project which started on Jan 10 and is currently more than 300 sites which operate as “hybrid” using the functionality of Eltek’s Smartpack controller.”

Head of Network Deployment and Operations for Vodafone Greece.

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Green Power
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Emerson Network Power

Company Background

Emerson Network Power provides innovative infrastructure solutions that maximize reliability, deployment speed and efficiency for communications networks. We are experts in leveraging hybrid technology to minimize OPEX costs and reduce the carbon footprint associated with GSM in areas with limited access to grid power.

Emerson's infrastructure solutions keep telecommunications and IT networks up and running regardless of whether the content is voice, data or multimedia.

Trust and enlist Emerson to manage all aspects of your critical infrastructure needs.



Product Description

Hybrid energy solutions from Emerson offer smart integration of renewable and traditional energy sources for indoor or outdoor environments in off-grid or on-grid peak shaving applications. Our reliable DC power supply systems in combination with hybrid power sources such as solar, wind, diesel and batteries, provide intelligent site management and integrated control.

Hybrid energy solutions from Emerson:

- Reduce energy consumption significantly with integrated energy optimization and temperature control technologies
- Minimize carbon footprint by an average of 30% utilizing hybrid energy solutions
- Maximize energy savings with eSure™ high efficiency rectifiers
- Leverage modular enclosure designs that enable flexible expansion and easy maintenance in the field

- Achieve significant OPEX savings through remote monitoring and comprehensive battery management capabilities

An integral part of our hybrid energy solutions is the eSure™ high efficiency rectifier. When compared to traditional rectifiers in the market today, eSure™ DC power technology significantly reduces CO2 emissions and operational costs, offering the highest efficiency in the industry at 97 percent. Efficiency can be boosted even further with ECO mode, a patented technology in our advanced controllers. By running only the number of rectifiers required for normal load conditions, maximum energy optimization can be achieved.

Geographic Footprint

Worldwide.

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Green Power
for Mobile

Ericsson

Company Background

Ericsson is a world-leading provider of telecommunications equipment and services to mobile and fixed network operators. Over 1,000 networks in more than 180 countries use Ericsson's network equipment, and more than 40% of the world's mobile traffic passes through Ericsson networks. Ericsson is one of the few companies worldwide that can offer end-to-end solutions for all major mobile communication standards.

Client List
Worldwide



Energy Efficient Portfolio

We offer a variety of energy-efficient products, solutions and services to help our customers reduce their environmental impact and also reduce the footprint of our own activities. Ericsson's solutions on node, site and network level are helping to minimize the power consumption while maximizing traffic. By drawing upon Ericsson's global consulting and technical capabilities, we can assist operators in every stage of the project, from initial baseline analysis through to implementation and final reporting and measurement of solutions deployed.

Products:

- Energy Efficient Radio Technology
- Site Power & Cooling Equipment
- Alternative Energy Sources
- Power Saving Features
- Remote Site Management
- Automated Network Power Management
- Energy Efficient Network Layer

Professional Services:

- Environmental Consulting
- Energy Assessment & Optimization
- Active & Passive Energy Management
- Lifecycle Assessment
- Data Center Efficiency
- Managed Rural Coverage
- Smart Energy Management

We work with efficient materials management to avoid hazardous substances and use resources more effectively and reduce environmental impact of manufacturing, use and end-of-life treatment. We offer free take back of decommissioned equipment in all the countries in which we operate

Geographic Footprint

Worldwide.

"For every site where we have made Ericsson recommended changes, we can reduce power consumption by between 22% and 30%."

Mike Wright, Executive Director of Networks, Telstra

Company

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Evance Wind Turbines Ltd

Company Background

Evance Wind Turbines, a world leading manufacturer of small wind turbines, has been designing and supplying small wind turbines for more than 12 years. Today over 1,500 turbines are installed around the world.



The 5kW R9000 small wind turbine, which is MCS and SWCC certified, has been designed to produce maximum energy yield, starting to generate energy at 3m/s and continuing to generate at high wind speeds. The turbine has a proven record of delivering class leading performance and reliability.

The R9000 is a versatile system for on-grid, off-grid and hybrid solutions. The Evance team, together with an extensive network of resellers and installers around the world, provide application advice and customer support.

Product and Services

Evance work closely with Mobile Operators and their Infrastructure Providers to develop flexible and robust green energy solutions. Focusing on reducing OPEX and CAPEX through integrated BTS and power delivery platforms. Evance is assisting in making previously uneconomical sites viable, reducing not-spots and helping to meeting regulatory requirements.

With few moving parts and no gearbox, Evance turbines are designed for durability and low maintenance, making them suitable for the high reliability required. Flexible solutions using hybrid green energy sources, with remote monitoring, and battery / diesel back up options, make the Evance solutions ideal for off-grid locations, reducing reliance on fossil fuels in remote sites. For both on-grid and off-grid locations, Evance can be a valuable partner in reducing the carbon footprint of network operations.

Most customers choose to purchase our solutions outright, however we have flexible finance models suited to the industry to support creating distributed wind energy.

Geographic Footprint

Worldwide.

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Flexenclosure

Company Background

Flexenclosure is a specialist provider of intelligent and "green" site power management solutions that have been especially developed for off-grid markets in developing countries. The company's revolutionary E-site base station site solution, with the Community Power option, has the proven ability to bring both communications and power to rural people in remote areas that previously had access to neither.

Client List

Safaricom	Emtel
Airtel	Millicom
MTN	



flexenclosure

Flexenclosure develops and deploys modular energy solutions that enable mobile operators to serve old and new, often rural, markets in an efficient and cost effective way. Flexenclosure's turn-key modular "green" energy solutions are based on renewable energy sources and are flexible, prefabricated, adaptable to local conditions and quick to install. Flexenclosure's product range contains solutions from power systems to complete data centers.

Product Description

E-site is an energy solution that enables base stations to be powered mainly by renewable energy (sun and wind). There is a battery bank for storage of generated energy and the wind turbines have been modified and perfected for this particular purpose. The key ingredient is Diriflex, the real-time control system used to optimize the performance of the solution.

The E-site solution has proved to reduce base stations' diesel consumption and CO2 emissions, by as much as 90 percent when

they are running on a 24/7 basis, and to reduce energy related operating expenses by over 80 percent. The ROI is high and the long-term TCO low. This enables operators to profitably roll out base stations in areas that have so far been unprofitable to operate in due to low average revenues per user, lack of access to the electricity grid and high costs for diesel fuel and maintenance.

Community Power is an E-site product developed together with Ericsson. It also comes as a standalone system. The system provides the possibility to share the power produced by E-site with the surrounding local communities to power e.g. mobile and battery chargers, street lights, clinics, schools etc.

The complete Community Power solution allows for full integration with the operator's messaging and billing systems, including central management of energy distribution to local outlets and appliances based on end-user energy purchases using their mobile phones.

"On E-site solution we believe the product is very good and a step in the right direction in making GSM sites more power efficient. We particularly like the intelligent power monitoring system and the innovation to have wind turbines designed for telecoms. The great reduction in generator running hours is a welcome move towards a green economy."

Samuel Mugo Kimani, HoD Regional NW Dep, Safaricom.

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Green Power
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GE Energy Storage

Company Background

Durathon Battery technology originated from a pursuit of a better power source for hybrid locomotives. GE Research evaluated various battery technologies and identified sodium nickel chloride batteries as the most versatile and effective solution for applications demanding high cycle life in harsh environments.



In 2007, GE acquired Beta R&D, a UK-based company that originally pioneered the development of sodium batteries and had already demonstrated the technology's reliability and durability through decades of research and development.

To date, GE has invested over \$200 million in technology and facilities to support its Energy Storage business. A quarter of the investment has supported creation of test facilities in the US, United Kingdom, India and China. Over \$100 million of the investment supported startup of a world-class manufacturing facility in Schenectady, New York. Officially opened in July 2012, production commenced in September 2011 using the latest ceramics, powder processing and welding technologies.

Product Description

With an energy density of 170 Wh/l, Durathon Batteries provide more energy in less space than traditional batteries. Their tolerance to severe environmental conditions

eliminates the operating costs of external heating or cooling systems, while their charge acceptance and projected lifespan of 10,000 cycles enables a reduction in fuel consumption by applications that use generators to maintain continuity of service. Each battery is equipped with an integrated Durathon Battery Management System (BMS) that provides a complete picture of the status and health of the battery throughout its long life.

Battery Financing

GE's Capital business has expertise in creating financial solutions customized to the specific needs of telecom operators, from leasing arrangements and payment for energy to simple loans

Geographic Footprint

Sub-Saharan Africa, Asia, SE Asia, Middle East, North America

"This is the beginning of a revolutionary technology that will change energy storage as we currently know it throughout the electrical industry, not only for telecom."

Brandon Marcus, Division Manager of Megatron-Federal.

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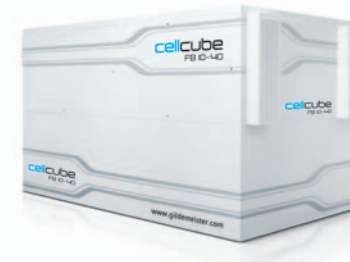


Green Power
for Mobile

Gildemeister Energy Solutions

Company Background

Cellstrom GmbH, an integral part of GILDEMEISTER energy solutions, is a provider of energy storage systems and solutions for a demand-driven, uninterrupted electrical energy supply. The storage of energy is based on vanadium redox battery technology. In 1999 the company's own developments were started and, in 2008, resulted in the first energy storage system produced in series: the CellCube FB 10-100



GILDEMEISTER
energy solutions

Cellstrom products are aimed at the sustainable use of global resources and stand out due to their high quality and reliability.

Cellstrom products are system solutions for many different applications, e.g.

- As a cost effective and safe replacement for high maintenance and environmentally damaging conventional and Lithium battery storage systems
- In weak grid with an unstable network
- As an off-grid solution in area with no grid connection
- Suitable for all signal transmission stations
- Scalable for multi operator / colocation sites

Product and Service Description

Cellstrom's vanadium redox flow-battery is an advanced energy storage system that is safe, environmentally friendly and operates at the lowest cost of any flow battery technology. The energy storage systems are unique: they are efficient, long lasting, low maintenance,

reliable and offer unlimited deep cycling capability to any state of charge.

The CellCube FB 10-40 is a 10kW / 40kWh deep cycling energy storage system, which allows off-grid telecom sites to cycle repeatedly, or integrate in hybrid form with diesel, wind, or solar energy generation. Unlike conventional batteries, life expectancy is over 20 years.

A CellCube energy storage solution will typically yield over 50% opex saving and Total Cost of Ownership saving of 35% over 5 years for an off-grid site running 24 hour generators. The CellCube is available with a power output of 10 to 200 kW and a scalable capacity up to the MWh range.

Geographical Footprint

Global, off-grid and poor grid installations.

Benefits of CellCube

- Reduction of Opex and Total Cost of Ownership
- Eliminating or mitigating constant increase in diesel prices
- Easy integration into DC telecommunication infrastructure
- Elimination of service and maintenance cost of legacy storage system
- Safe, environmentally friendly and reusable
- Simple integration into standard online and remote maintenance systems

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Green Power
for Mobile

Heliocentris Industry GmbH

Company Background

Heliocentris. Multi-Hybrid Energy Solutions for Telecom.

Heliocentris is specialized in autonomous energy supply and energy efficiency solutions with the aim of replacing diesel generators with "zero-emission" products.

The company, which was founded in Berlin in 1995, develops and markets innovative and sustainable systems in power and energy generation as well as turnkey solutions for customers in industry and the academic field.

Client List

du (Emirates Integrated Telecommunications Company)
Telesite Ltd (Mozambique)
Telecel (Zimbabwe)
HCPT/Hutchison (Indonesia)



Solutions

Heliocentris provides Energy Management and Clean Energy Solutions for wireless networks at off-grid, bad-grid and on-grid locations. With services during the entire life cycle, from consulting, planning, implementation and lifetime optimization services, Heliocentris guarantees a customer oriented and optimized offering.

"Heliocentris is the only supplier to meet and even overachieve contractual performance requirements."

(CTO HCPT Indonesia).

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Green Power
for Mobile

Huawei Hybrid Power – PowerCube

Company Background

Based on the professional accumulation of ICT network over 20 years, Huawei launches PowerCube: the innovative hybrid power solution for telecommunication sites.

PowerCube focuses on saving energy and reducing OPEX through maximally improving energy transferring efficiency. Over 22,000 PowerCube have been deployed all over the world, serving more than 85 operators in 80 countries, including MTN, Zain, Airtel, Vimpelcom, Vodafone and so on.



Product Description

PowerCube is a new generation hybrid power system. With the newest energy controlling and transferring technology, it makes full use of energy sources such as solar, diesel and grid. Diesel hybrid, grid hybrid and solar hybrid series can be selected to meet different scenarios.

The core concept of PowerCube is "Saving, Single, Smart".

Key Characters:

- **Saving:** fuel 40%-60%, footprint 30%-70%, maintenance up to 90%
- **Single:** single platform, modular design, smooth expansion & evolution
- **Smart:** intelligent NetEco system achieves highly efficient operation & maintenance management

PowerCube realizes the maximally saving for customers by using Bit Managing Watt Technology to achieve high efficiency of energy conversion and utilization.

As for solar hybrid solution, SolarMax technology achieves high tracking accuracy, high sensation of light, high conversion efficiency and high temperature adaptability. As for diesel hybrid solution, DieselMax technology improves efficiency in each procedure of energy flow from end to end. As for grid hybrid solution, GridMax technology maximizes using grid with fast chargeable energy storage system.

Through advanced operation support system – NetEco, PowerCube helps the operators greatly improve energy management efficiency for reducing OPEX.

Geographic Footprint

Worldwide.

ICT network energy efficiency specialist Reliable partner for customer

Company

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Green Power
for Mobile

Hybrid Energy Solutions Limited

Company Background

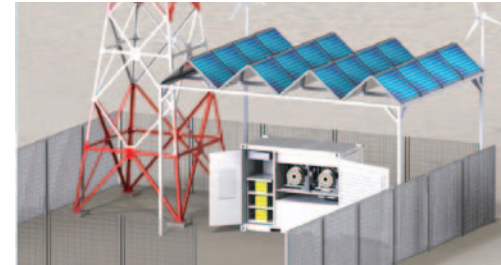
Hybrid Energy designs and manufactures state of the art DC Hybrid energy stations for cell-tower and Community Power applications. Using the latest renewable energy technologies, Hybrid assists operators in reducing costs as well as CO2 emissions whilst delivering the most reliable and robust power solution to off-grid and grid-connected sites.

Client List

Telefonica	Airtel
BT	Sigma Wireless
3	Tasc Towers
Vodafone	Seder Telecom
Meteor	Future Communications
Shared Access	Company Ltd (FCCI)

Shared Access is a developer and owner of shared wireless infrastructure, specifically for the use of mobile & broadband operators. "We meet many challenges securing network power due to, planning requirements, time pressures, site locations that are often remote, and local community issues. We have deployed HYbrid Energy stations as an alternative in some instances to grid power, their DC systems have enabled us to fulfill our operational and design standards, providing cost effective and reliable alternatives to grid supply."

Niall Clyne, Director of Rollout, Shared Access Ltd.



Hybrid Energy has a 130,000² meters manufacturing facility in China and R&D facilities in Ireland. Moreover, Hybrid Energy International provides full managed services contracts including energy on a \$ per hour basis. Hybrid Energy International is headquartered in Dubai and supports projects across Middle East, Africa & Asia.

Products & Services

Hybrid's core technology platform is based around low voltage DC power generation and Energy Storage. Utilizing state of the art Lithium Ion battery technology together with high efficiency photovoltaic arrays and wind turbines Hybrid can eliminate or reduce engine run time. If an engine is needed, Hybrid Energy DC generator will start automatically to ensure Power is never lost. The fully integrate systems can be dropped on site and installed within minutes.

Community Power Model

The Hybrid Energy micro grid and community power model can open up access to affordable Energy to 1.2 billion people who currently don't have access to electricity. Hybrid Energy has deployed systems in Europe, Africa, Middle East, and Central America and has recently established partnerships in Malaysia and Indonesia.

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Website

www.hybrid.ie



Green Power
for Mobile

NorthStar Battery

Company Background

Established in 2000, NorthStar designs and manufactures premium, high performance lead-acid batteries and energy-saving battery cabinets. NorthStar products deliver longer battery life and a reduced environmental impact, at a lower total cost of ownership. Truly a global company, NorthStar has state-of-the-art facilities in the USA, Sweden, China and India, with products used in more than 120 countries worldwide.



All NorthStar high performance batteries are proudly manufactured in the USA, using the latest automated robotics technology and environmental control systems, to deliver the best consistency and reliability in the battery industry. NorthStar battery cabinets are designed and manufactured in Sweden on a fully automated production line, ensuring a low thermal conductivity, maintenance free design.

Product and service description

NorthStar's premium telecom products include the SiteStar™ Cabinet, which is the world's most efficient battery cooling system, as well as a range of high performance long life AGM batteries. OPzV batteries are also available.

The SiteStar™ Cabinet uses active compressors and advanced airflow, ensuring optimal battery operating temperature and extended life. SiteStar™ Cabinets have ingress protection class IP55, with CE and UL approval, and a range of optional kits.

The NSB *Blue + battery* is a high-cycling battery developed for use in areas having unstable power grid conditions. It has been extensively deployed in Indonesia, Bangladesh and in African countries. It is a true uPSOC (uncontrolled partial state of charge) battery, discharge cycles may be started without the battery being fully charged without adverse effect on life. It is suitable for UPS applications.

The NSB *Red battery* uses pure lead grid developed to provide exceptionally long float life at elevated temperatures under stable AC power grid conditions.

The NSB *Yellow battery* is a high quality battery designed to compete with products manufactured in Asia.

NorthStar batteries have an impressive operating temperature range of -40°C to 65°C because of their innovative design and PPO (high modulus polyphenylene oxide) cases.

Geographic Footprint

Worldwide.

Company

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Springfield
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Green Power
for Mobile

Novergy Energy Solution Pvt. Ltd.

Company Background

Novergy is your reliable Solar energy partner. We are a manufacturer of HIGH Efficiency Solar Photovoltaic modules (Suitable for Telecom application), DC and AC Electrical parts, Electronics Like Hybrid integrated All in One controller & High efficiency Inverter. Through our sub-vendors we are also able to offer Mounting structures and Battery bank.

Client List

Tata-Quippo (Viom networks), India Safaricom, Kenya	Tunisie telecom, Tunisia Nepal telecom, Nepal	Idea Cellular, India Exicom Telesystem, India
--	--	--

Company

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India

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Telephone

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24504672415488
24504672415488



Certifications / accreditations

Novergy products are certified by leading organizations like:

- TUV Rheinland, Germany
- Clean Energy Council, Australia
- VDE, Germany
- MNRE, India
- DNV

Product and description

1. Different Options Of Solar Modules

- **High efficiency** Solar Photovoltaic Modules (cell efficiency of 19.4% and module efficiency of 16.8%)
- High efficiency Modules in BLACK Color (Suitable for Aesthetically pleasing solar installations) Can be offered with complete black color of Structure, cabling, J. Boxes.
- Flexible Light weight Solar modules can be fixed on various types of curved roofs / wave shaped roofs and also for roofs which can not take much weight.

2. Telecom INTEGRATED All-in-One

system: This product is designed for telecom applications and has a complete system including the following special features:

- High efficiency Solar Inverters (Upto 98.7%)
- DC and AC Protection boxes / panels
- Mounting structures
- Other Items required for completing system

3. Other Solar Product: Solar Aviation lights

Novergy Services: Our company is headed by very experienced technocrats having handled large scale projects upto USD 400 million.

Geographic Footprint

These systems are sold to nearly 20 countries worldwide including :

India, Germany, Italy, Spain, Kenya, Nigeria, Senegal, Australia, Oman, UAE, Togo, Tunisia, Sri Lanka, Nepal, Mozambique, etc.

Network

Novergy is present in various locations such as:

- Multiple locations across India
- A number of distribution / system integration partners across the globe especially in Europe, Africa, Middle East, Asia, Central America, etc.

Off.Grid:Electric

Company Background

Off.Grid:Electric is a distributed clean energy utility headquartered in Arusha, Tanzania and serving the East African market.

We build, own and operate small-scale home solar systems serving populations and businesses that suffer from an unreliable, expensive, or non-existent grid.

Off.Grid:Electric's M-POWER service represents an innovative approach to the market, whereby customers pre-pay for energy services.

Energy is provided by world-class plug-and-play solar systems installed in their homes. M-POWER systems include not just the energy system, but the world's most efficient lights and small appliances. Consumers do not buy hardware, they merely pay for the service.



After installing the system, customers purchase credit in order to use the system. Payments are sent via mobile transactions, from the direct customers, or potentially as a payroll deduction, in the case of employee housing.

Should a system require repair or a customer wish to upgrade, we provide complete support ensuring that no M-POWER customer is ever left in the dark.

Solution Description

Off.Grid:Electric delivers on a complete technical, operational and financial model that makes incredibly high quality renewable electrical services radically affordable to the world's off-grid poor. It is a model that will scale to millions of homes. We don't sell gadgets or lanterns, we sell electrical services, pre-paid in small amounts. We provide 15 to 50 times more light to our customers for less money than they are already spending on energy substitutes.

We have taken the best ideas and technologies from around the world to come up with an amazing solution for our customers. We have started with world famous German engineering and cutting edge manufacturing technologies from Asia. We've combined it with the wildly effective pay as you go model and mobile money network from the African mobile phone industry. We manage it using software and distribution techniques learned from a decade of experience in e-commerce and the Silicon Valley. We have made it profitable through financial and business model innovation inspired by decades in the renewable energy market in the USA. We deliver incredible customer service and operational excellence honed through decades of experience living and working in Africa. We implement it all with exceptional local leadership and world class partners.

Geographic Footprint

Africa

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Arusha Tanzania

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offgrid-electric.com



Green Power
for Mobile

Orun Energy Ltd

Company Background

Orun Energy Ltd, is a leading developer and innovator of clean technology and remote monitoring solutions for the small distributed generation and captive power markets globally. Orun Energy Global leads a consortium of twelve (12) companies (Battery Management Systems, Battery Manufacturers, Remote Monitoring Solutions, Logistics and Supply Chain, Operations and Maintenance, Efficient Cooling Systems, ERP Systems, DC power systems etc) whom are globally recognised in their respective sectors.

Client List

Viom Networks India

“This is in reference to trials & tests of your equipment on two of our mobile tower sites, we are pleased to know that there has been a decent saving on energy expense due the technological intervention done by your organisation”

Bharti Hexacom Ltd India



The primary focus of the consortium is to introduce alternative power technology and energy efficiency solutions for the fast growing African and Asian markets. Orun Energy's current focus is the rapidly growing telecoms and financial services market in Africa and India

Product and Services

The Orun Solution is a Hybrid Power System designed to revolutionise the way power is produced, stored and used in telecom base stations. The combination of advanced battery technology, efficient DC cooling components, remote monitoring and the tight integration of all components with our micro processor based control system has produced diesel savings of above 90% in actual live tests which have been ongoing for over a year in India.

Other benefits of the HPS include improved network uptime due to high redundancy and real-time monitoring; reduced maintenance – due to reduced usage of Diesel Generator, control of fuel theft and false deliveries, central management of sites, Delivered ROI in less than 9 months, Rapid roll out.

Geographic Footprint

India, Bangladesh, Nigeria, South Sudan, DRC, Ghana, Uganda, Mozambique.

Company

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Green Power
for Mobile

Pamoja Cleantech

Company Background

Pamoja Cleantech specializes in innovative biomass technologies for off-grid electricity applications. We offer full service agreements, operation and maintenance which enables telecom operators to outsource their entire energy supply. Thus our customers avoid CAPEX investment in energy infrastructure and allows savings up to 30 % of current diesel supply OPEX.



Pamoja Cleantech was founded in 2010. The company has designed a hybrid energy system that combines solar PV and biomass gasification technologies. Implementation of this inclusive energy system in Uganda during 2013 is supported by the World Bank and the Swedish International Development Agency.

Product and Services

Pamoja Cleantech holds expertise in renewable energy engineering, natural resource management, market and business intelligence, social empowerment and skills training. We provide services and consultancy for the energy supply of telecom companies including feasibility studies, business model elaboration, equipment selection, power plant design, biomass supply implementation, training and system installation. We are a service outreach partner and we work with a range of suppliers in biomass gasification technology.

Through the integration of the local community we build short-cycle operations supplying the energy system with biomass for feedstock. Our approach to energy production creates a local symbiotic system which nurtures sustainable development and strengthens the customer base of the telecom industry.

Geographic Footprint

Sweden, USA, Germany, France, Spain, Finland, East Africa.

“Our product is an off-grid platform for Sustainable Energy, ICT and Life Services exciting local entrepreneurship in rural communities.”

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Green Power
for Mobile

Phaesun France SAS

Company Background

Phaesun GmbH has been specialising in the sales, service and installation of Off-Grid photovoltaics and wind energy systems since it was founded in 2001. As one of the leading system integrators in Off-Grid energy systems on an international scale, Phaesun offers products of the most renowned manufacturers in this trade. International project management, systematic customer training and technical support complete the services offered. Being one of the major companies in Off-Grid solutions for emerging countries its staff can look back on more than 20 years activity in this field.

Client List

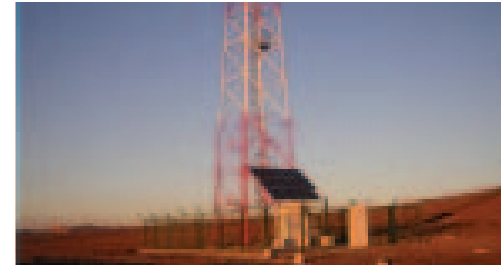
Dialog Axiata Plc
Telma Mobile

Maroc Telecom
Telecel
Telkom SA

Digicel
Ericsson
Ethio Telecom

MTN
Warid Telecom

“Our telecom station is now plugged to the sun. This stand-alone energy solution with PNGM energy management is a major step into a future without any grid-disruption. Additionally there is no more noise on site; neighbours will sleep in peace.”



Phaesun headquarters are in Germany and its subsidiaries and associated companies are based in France, Eritrea, Greece, Sudan and Panama. They can fall back on a worldwide network of partners and distribution channels.

In France, Phaesun also has innovation activities by investing annually in photovoltaic research and development.

Products and Services

The Phaesun business activities include two divisions. The “Solar Component and Sales Division” is responsible for the wholesale distribution of selected, high quality Off-Grid-components. Phaesun acts worldwide as an intermediary between manufacturers and wholesale customers. The “Solar Systems and Installation Division” is a service division, realising entire projects for Off-Grid applications (for rural, water-pumping, telecom, oil and gas and leisure segments) including system sizing, design, manufacture, assembly, delivery and support services to its customers.

Through the Phaesun Off-Grid skilled centre for development, design, engineering and implementation of solar power solutions, Phaesun offers both hardware and software. The most important cases are modular pure solar and hybrid solar sites (AC or DC Bus) including data logging software (Phaesoft) and web-based remote monitoring (Phaeweb), array antitheft solutions and project services (FAT, SAT). We notably deployed more than 400 PNGM charge control units since end of 2010.

With various partners, Phaesun is involved in a permanent solar solution development program aiming at technology package improvement (offer development, energy storage) and TCO optimization (CAPEX, OPEX, RoI).

Geographic Footprint

Around the world: Phaesun Group (Phaesun GmbH, Phaesun France SAS, Phaesun Asmara, Phaesun SA Panama) and its network of associated companies have a worldwide presence.

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Green Power
for Mobile

PNN Group

Company Background

PNN is a pan-African technology service provider that has been in operations for over 14 years with a presence in 9 countries, playing a significant role in the development of the communications and power sectors of the economy.

Over the last 14 years, we have grown into a group of companies focused on the sale, deployment and management of communications and power infrastructure throughout Africa.

Client List

Airtel	MTN	Safaricom
Visafone	Yu Telecom	Swap Technologies
Etisalat	MultiLinks	
Warid Telecom	Globacom	



PNN currently employs over 250 staff, comprising of both expatriates and indigenous persons, in Nigeria, The Gambia, Ghana, Kenya, Liberia, Rwanda, Sierra Leone, Tanzania, and Uganda, and we aim to expand into a minimum of 20 African countries by 2015.

Product and services

At PNN, we build biomass, wind and solar hybrid community power plant networks to serve small communities, large cities and everything in between. Our community power system rides on a smart micro grid power distribution (SMGPD) system where electricity is generated from a scalable mesh of energy sources, close to where it is used.

PNN provides turnkey supply and deployment of communications infrastructure that supports our clients' current needs and their expansion plans. PNN has deployed varied communications solutions using

various financial models, which include Build Operate and Transfer (BOT), Build Own and Operate (BOO).

At PNN, we provide several value added services to all our customers. These include: online services, premium rated content aggregation services, mobile content services: ringtones, mobile quizzes, voting & surveys, SMS-based airtime distribution, Software-as-a-service (SaaS).

Geographic Footprint

Nigeria, The Gambia, Ghana, Kenya, Liberia, Rwanda, Sierra Leone, Tanzania, and Uganda.

"PNN managed and maintain communication sites for Airtel in the south west region from 2005 they also did Cell on Wheel (COW) projects for us"

Airtel

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Green Power
for Mobile

PowerOasis

Company Background

PowerOasis is the leading supplier of Telecom Power Solutions for off-grid & unreliable grid telecom sites, providing grid autonomy with a renewable energy option. The solutions are modular, easy to install, flexible for the future and provide the lowest TCO. PowerOasis solutions bring performance and simplicity to a complex environment, all underpinned by a comprehensive network wide power management platform.

Client List

Vodafone	Orange
Ericsson	MTN
Digicel	T-Mobile
Motorola	Samsung
	Alcatel-Lucent



PowerOasis is a technology lead company with a strong mobile industry background. With a combined mobile engineering experience totaling many hundreds of years, PowerOasis understands the challenges faced by network operators, knows how to deliver network-wide rollouts and possesses unrivalled knowledge of power, battery and renewable integration and management. PowerOasis solutions are proven to deliver:

- Lower operational cost (OPEX)
- Extended battery life
- Extended generator life
- Increased site availability
- Lowest TCO

Products and Services

PowerOasis designs and manufactures hardware and software products, provides training and installation services for turnkey solutions and can deliver a comprehensive power consultancy capability. The product solutions consist of a modular platform to

support a variety of base station power loads and control a comprehensive selection of power sources including generators, grid, fuel cells, PV and wind.

The PowerOasis Hybrid Power Systems (HPS) can be used purely with renewable sources of energy to totally remove the need for a generator or grid connection (weather conditions permitting). However, the most common solution is to use solar as a complementary energy source to reduce dependence on prime energy source. The HPS takes several forms:

- HPS Unreliable Grid
- HPS Off Grid
- HPS Green Power (Solar/Wind)
- HPS CDC Hybrid Cycling
- HPS Power Monitoring

Geographic Footprint

Europe, SE Asia, N Africa, E & W Africa, S Africa, Middle East, N America.

“I have benchmarked competitive systems but the PowerOasis system is an outstanding solution. They have nailed the product performance, cost, flexibility and ease of installation”

J Parker, Director, GreenArc

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Green Power
 for Mobile

Power-One

Company Background

Power-One® designs and manufactures energy-efficient power conversion and power management solutions for renewable energy, routers, data storage and servers, wireless communications, optical networking, medical diagnostics, railway controls, semiconductor test equipment and custom applications. Power-One's evolution into a tier-one supplier, competitive on a world-class level, has been facilitated by a complement of strategies and milestones.



Power-One employs thousands of people worldwide and is certified to ISO standards for all facilities. Customer support, R&D centers, and manufacturing operations are strategically located in the Americas, Asia, and Europe. Corporate headquarters are located in Camarillo, California, USA. Power-One is firmly positioned as number 2 in the global Renewable Energy market.

Product and Service Description

Combining many years of telecom power systems experience with renewable energy expertise, Power-One has developed a modular and fully integrated hybrid solution for telecom applications. The addition of hybrid controllers to the Guardian portfolio enables optimal battery cyclic operation as well as energy management for grid/genset and solar/wind energy.

The modular approach for indoor or outdoor arrangements allows for a minimum initial investment and also a “pay-as-you-save” solution with the option of adding hybrid building blocks to existing Guardian installations. The solar and wind converters (FPV30.48 and FPW30.48) mark the extension of the Guardian high-efficiency rectifier range into the renewable energy realm. These hybrid core components are accompanied by a range of accessories and along with the Guardian rectifier and DC/DC series it provides a system solution that maximizes the energy efficiency on all aspects of the site performance.

Geographic Footprint

Worldwide

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Green Power
for Mobile

SAFT

Company Background

Saft (Euronext: Saft) is a world leader in the design and manufacture of advanced technology batteries for industry. The Group is the world's leading manufacturer of nickel batteries and primary lithium batteries for the industrial infrastructure and processes, transportation, civil and military electronics' markets. Saft is the world leader in space and defence batteries with its Li-ion technologies which are also being deployed in the energy storage, transportation and telecommunication markets.



Saft offers a range of specialized telecom batteries, based on advanced technologies, that deliver efficient and reliable backup power to ensure continuity of service for a wide variety of applications, such as central offices, remote terminals and cellular base stations for both on-grid or stand-alone sites. Saft's 4,000 employees present in 19 countries, its 16 manufacturing sites and extensive sales network all contribute to accelerating the Group's growth for the future.

For more information, please visit Saft at www.saftbatteries.com

Product and Service Description

Evolion is a new evolution in high energy storage batteries for outdoor on-grid sites, off-grid sites and DPCO installations. The Evolion module has a 48 V voltage and a rated capacity of 77 Ah. Evolion offers a unique combination of float charging capability and high cycling performance. Its key features include: high energy storage in a compact, weight-saving package; high efficiency; long

calendar and cycle life – even when operating in extreme temperatures. Evolion's compact and lightweight design makes it possible to deliver the maximum possible performance from the limited space available within telecom cabinets. Its high volumic energy means that it only needs half the space required by a conventional VRLA battery. For remote installations, the zero maintenance design coupled with intelligent remote supervision eliminates the need for routine site visits. Evolion is four to ten times lighter than conventional batteries, depending on the application. This makes it feasible to collocate the battery system with the active telecom equipment, even on raised floors.

Geographic footprint

Saft's dominant market positioning is based on technical excellence and the largest international industrial and sales presence in the world. Located in 19 countries, the Group has 16 wholly-owned production sites.

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Green Power
for Mobile

Urban Green Energy

Company Background

UGE delivers simple energy solutions. With projects in over 70 countries, UGE is the leading name in Distributed Renewable Energy (DRE) solutions at a global scale. We leverage proprietary tools and technology, including our OEM vertical axis wind turbines, to deliver end-to-end solutions aimed at bringing cost savings, reliability, and sustainability directly to end users.

Client List

Verizon
T-Mobile
Claro



Unlike many systems integrators and product suppliers, UGE looks at our clients' energy challenges holistically before recommending an energy solution. By starting with our customers' needs, we do more than just offset the energy otherwise provided by the electrical grid or back-up generators - we provide peace of mind.

Product and Service Description

UGE Fusion provides telecoms companies with the energy they need for a simple monthly rate. For tower owners and operators who are dissatisfied with expensive and unreliable power supply, UGE Fusion offers a complete energy solution that provides more reliable energy at a fraction of the cost. We accurately evaluate the energy resource, supply the technology, finance the project to reduce investment burden, and operate & maintain the sites, all under one roof.

Unlike other integrated solutions on the market, UGE works directly with end users at every step, from assessment, to planning and design, to financing and implementation to be sure that the solution is tailored to fit every site.

Under the UGE Fusion energy service agreement (ESA), the customer signs an agreement with UGE in exchange for guaranteed energy supply. This includes all assessment, planning, implementation, and site operation and maintenance (O&M) for the duration of the contract period. UGE offers financing where applicable, saving the customer money from day one.

Geographic footprint

Worldwide

"The UGE Fusion system designed to power our communications tower has saved us \$30,000 per year in diesel fuel expenses."

Chinese Navy

Company

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Green Power
for Mobile

WindGen Power East Africa

Company Background

WindGen Power was founded in 2011 with the mission of locally fabricating small wind turbines for use with off-grid renewable energy systems in East Africa. WindGen fabricates small turbines up to 1kW in size in its Nairobi fabrication facility, and also imports larger turbines, up to 10kW, from the USA. Since inception, WindGen has evolved beyond wind and now offers renewable energy solutions that involve solar and other renewable sources.



WindGen specializes in designing and implementing power systems of a broad range of sizes in challenging locations where cost-effectiveness and reliability are paramount. By taking a holistic, customer-focused approach to projects, WindGen is able to offer customized turnkey solutions tailored to the needs of the client.

Product and Service Description

While WindGen's initial focus was on solar and wind power systems for residential, tourist, and community facility applications, a recent partnership with a manufacturer of high quality 2.5kW and 10kW wind turbines has enabled WindGen to offer solutions for more energy-intensive commercial applications as well. WindGen systems integrate wind, solar, and generator power to create optimized hybrid systems.

As an end-to-end solution provider, WindGen's services include system design, system monitoring and data collection, project advisory, system maintenance, and custom small turbine manufacturing. Complementing these service offerings are a broad range of products including wind turbines up to 10kW, solar panels, deep-cycle batteries, inverters, controllers, and solar/wind mountings and towers.

Geographic Footprint

Headquartered in Nairobi, WindGen Power serves the East African region.

"WindGen is one of the most reliable companies I have ever come across. The kind of materials and equipment they used to install power in our school are of the highest quality. Their staff and manpower personnel are qualified and customer-friendly."

Head Teacher of Naserian Primary School, Kajiado, Kenya

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Green Power
for Mobile

Zephyr Corporation

Company Background

Zephyr's telecom solutions bring innovation to the energy used in mobile telecommunication operator businesses. Due to its ultra-lightweight design, the small wind turbine Airdolphin can be mounted onto existing towers of base stations. As part of a hybrid power supply system in conjunction with photovoltaic panels, it can greatly reduce not only the cost of energy, but also the operational cost. Airdolphin receives international praise for its effective contribution towards environmental conservation, for which there is increasing social demand.

Client List

Turkcell	Vipnet
T-mobile	MTC
Vodacom	



Zephyr was established in 1997, and we have installed over 5000 turbines around the world. We entered the telecom market in 2009 after extensive R&D produced a range of turbines specifically for the telecom systems. Zephyr offers thorough support as an industry expert and the most dependable advisor in renewable energy.

Product Description

Zephyr Corporation's turbine Airdolphin:

- Power all types of base stations - GSM, WCDMA, WiMAX, wifi and TETRA
- Can be used as the sole source of power or combined with PV panels, diesel generators, batteries, and/or hybrid controllers
- Can be installed at new sites or used to retrofit existing sites
- Small & Lightweight - diameter of 1.8 m and 18 kg. It can be quickly and easily installed on existing towers = low CAPEX & easy installation

- Able to start deliver energy at very low wind speed - 2.5 m/s = 5.6 mph
- Minimum maintenance required, and can be controlled via internet access

Geographic Footprint

Worldwide.

"Zephyr Corporation's turbines easily out-performed the others we tested generating reliable power which means a stable supply for the base stations of T-Mobile."

Zvonko Magić, managing director at Energyplus.

Contact

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ZTE Power

Company Background

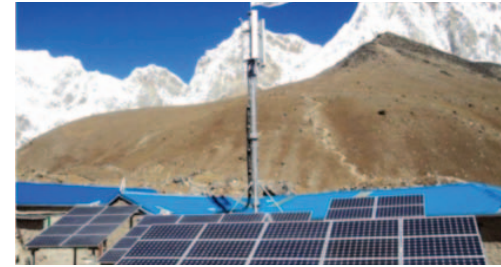
ZTE setup a R&D department of telecom power products in 1995, since the day it was set up the team has gained rapid development with its in-depth understanding on telecommunication technology and become one of the biggest and strongest research team in China's telecom power supply industry. There are about 1,200 employees working for ZTE power supply product line now, over 500 are working in the R&D department and 80% of them are with degree of mater or above.

Client List

Airtel	MTN
CMPak	Mobinil
Ethiopian Telecommunications Corporation	Sudan Telecom Company Co. Ltd
Etisalat	Zambia Telecommunications
Econet	Zain

"ZTE's strong capability of fast construction and deployment, which will help we build more green sites to strongly support our telecom network. We look forward to having further cooperation with ZTE Corporation"

Mobinil



Every year, ZTE power invests over 10% of total revenue into R&D. As a dedicated and innovative company, supporting research and development of new technologies, ZTE Power has obtained more than 192 national patents in power, electricity and electronics, 85% of which are invention patents.

ZTE power has a comprehensive portfolio that includes custom telecom AC and DC power supply systems, back-up power products, UPS, green energy solutions and a range of power enclosures /accessories.

ZTE power has 10 years of experience in renewable energy solutions including solar, wind, hybrid energies. The "Energy Matrix" design system has been very effective at fostering the deployment of renewable energy sites.

Product and Service Description

ZTE provides two types of green energy solutions. One is an integrated household system: a solar power solution and the other is a micro-grid solar hybrid power solution.

The integrated household solar power system efficiently converts solar energy and can help the owner access electricity for life. It can be used for various house appliances such as fans, lightings, device which charging handsets, household batteries etc.

The micro-grid solar hybrid power solution uses the PV module to convert solar energy into electricity and stores the electricity into batteries which power the load at night. The micro-grid solar hybrid power system can support the energy input from other source such as generators or grid power. Micro-grids are mainly used for school, hospital, vaccination refrigerators, office building, island, army and residential community.

Geographic Footprint

Afghanistan, Bangladesh, Congo, Colombia, Ethiopia, Kenya, Mongolia, Nigeria, Pakistan, Sudan, etc.

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Green Power
for Mobile

Index

Solar Power

Ameresco Solar	7
Apollo Solar	8
Noverg Energy Solution Pvt. Ltd.	23
Phaesun France SAS	27

Wind Power

E Vance Wind Turbines	15
WindGen	33
Zephyr	34

Fuel Cells

Ballard Power Systems	10
-----------------------	----

System Integrator

Clean Power Systems	11
Ericsson	14
Flexenclosure	16
Heliocentris Industry GmbH	19
Huawei Hybrid Power	20
Hybrid Energy Solutions Limited	21
PNN Group	28
Urban Green Energy	32
ZTE Power	35

Energy Service Company (ESCO)

Applied Solar Technology (AST)	9
Off.Grid:Electric	24
Orun Energy Ltd.	25
Pamoja Cleantech	26

Energy Management System

Eltek	12
Emerson Network Power	13
PowerOasis	29
Power-One	30

Storage

GE Energy Storage	17
Gildemeister Energy Solutions	18
NorthStar Battery	22
SAFT	31