



OFF GRID GUIDE 2020

A definitive guide to powering your home or business off grid



ENERGY SOLUTIONS

INTRODUCTION

Energy Solutions are the UK's leading supplier of off grid power systems supplying high quality systems to residential and commercial customers across the UK and internationally for whom connection to the grid is not a viable option.

Our range of Off Grid Solutions includes EasyGrid – a plug and play solution for homes and businesses looking for a straightforward, affordable way to generate their own power; SiteGrid – solution for situations with larger power requirements that need sophisticated control and monitoring; and Containerised systems – robust, semi bespoke systems ideal for isolated projects.

See our Case Studies for examples of how our systems are being used by customers in various locations.

Our systems offer reliable, efficient, sophisticated power to businesses and home owners and give owners periods of silent power. The option to link into a range of renewable energy is a key part of the systems alongside our personalised controls and programming.

Our customers use off grid power solutions for many reasons including:

- Location makes a grid connection too expensive or not possible.
- A need for uninterrupted power - protection from power cuts and the ability to power independently in all conditions.
- The ability to maximise the use of renewable energies.
- Eco friendly - using green alternatives alongside traditional options.
- Adaptable and expandable power to accommodate changing uses.
- Silent Power - an alternative solution to 24/7 generator power
- Reducing emissions



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LIVING OFF GRID – RESIDENTIAL

Living off grid is a lifestyle choice for some, but an economical necessity for many. Even in advanced western economies the grid does not reach everywhere – and getting it extended to reach your dream property can be a surprisingly expensive proposition.

So how can you live a grid connected lifestyle without the grid? Many property owners have done this by installing diesel generators to supply their needs. These either run 24/7 or are turned off overnight. These overnight periods can either be without power, or small loads such as central heating boilers and fridges can be run from a battery supplied inverter.

These systems work well, but there is a cost. Diesel is a variable cost. Long generator running hours also mean frequent servicing and replacement.

Any off grid system will require careful selection. The power supplies are finite – unlike the grid! When considering the capacity of the system you will need to be realistic about your power consumption – including peak power. Under sizing the system will result in power outages and / or extended generator running time. The up front costs of a larger system need to be balanced against the ongoing fuel costs.

The Off Grid systems from Energy Solutions are designed to optimise generator usage – cutting fuel consumption and wear and tear. We can also integrate renewable energy into the system to further drive down your fuel costs. We achieve these savings by using state of the art inverter charger units that regulate the loads applied to the generator to keep it loaded but not overloaded.

Of course the first priority is to be as efficient as possible in your use of energy. Modern 'A' rated appliances, low energy lighting and good insulation will all reduce your demands. The figures and illustrations within this document are all based on 15 kWh of energy usage a day (the average UK domestic usage according to Energy Trends 2007 is 4800 kWh – 13.15 kWh per day). Modern homes, built to code 4 of the sustainable homes, can use less than half of this amount.



SIZING YOUR OFF GRID SYSTEM – RESIDENTIAL

Electric Power Consumption at Home

This list of household appliances will help you assess the power you may be using and what size off grid system you need to consider purchasing.

Appliance	Power	On-time	Energy/day	minimum summertime base load for a two person household
High efficiency refrigerator	20W	24h	480Wh	480Wh
High efficiency freezer (with DC permanent magnet compressor motor)	20W	24h	480Wh	480Wh
Average refrigerator	50w	24h	1200Wh	
Average freezer	60W	24h	1440WH	
Plug-in chargers and standby loads	30W	24h	720Wh	720Wh
Modem	10W	24H	240Wh	240Wh
Ventilation	30W	24h	720Wh	720Wh
Electric space heater	2000W	12h	24,000Wh	
Hot Water heater (boiler)	3000W	2h	6000Wh	
Central heating (on) and water heater (on)	130W	8h	1040Wh (wintertime, gas fired)	
Central heating (off) and water heater (on)	130W	2h	260 Wh	260Wh
High efficiency lighting	200W total	6h (winter)	1200Wh	240Wh
		3h (summer)	600Wh	
One 100W traditional Incandescent lamp	100W	6H (winter)	600Wh	600Wh
		3h (summer)	300Wh	
Radio	30w	3h	90Wh	90 Wh
LCD TV	50W	3h	150Wh	150Wh
Large Plasma Screen TV	300W	6h	1800Wh	
Personal Computer	100W	3h	300Wh	300Wh
Laptop	30W	3h	90Wh	90Wh
Range hood	150W-300W	1h	150Wh	150Wh
Total summertime baseload, energy conscious two person household.				4520 Wh =4.5 kWh

This table will help you to assess your power requirements for an average residential dwelling in the UK.

WORKING OFF GRID – BUSINESS



Our solutions can incorporate the very latest Lithium Ion battery technology and our proprietary power management system. These systems when coupled with renewable energy sources provide an off grid power source that has unrivalled efficiency both in terms of fuel usage and generator management.

The rising cost of fossil fuels and the increased demand for power in today's modern society have been key factors in the development of our solutions that can be used both in developed countries and emerging markets. The main development of our systems has centred on the supply for rural businesses and properties where connection to the main grid has been unreliable or uneconomic.

Energy Solutions are specialists in electrical power systems for businesses where there is either no grid or intermittent grid power.

Our range of Off Grid power solutions are currently being supplied to industrial and business sites, providing electricity to areas that otherwise would have no economic access to power.

We have built upon this experience to develop products for humanitarian relief, remote telecom masts and numerous commercial applications.

All of our systems have the ability to provide remote monitoring which can also provide alerts such as low fuel. The fail-safe backup is being able to run the generator in the event of a failure of the systems. Connections are also provided for external generators to be connected during service times.



SIZING YOUR OFF GRID SYSTEM – BUSINESS

Electric Power Consumption - Small Business

This list of appliances will help you access the power you may be using and what size off grid system you need to consider purchasing.

Appliance	Power	On-time	Energy/day	minimum summertime base load for a small business – 5 employees
Computer x 2	100W	3h	300Wh	300Wh
Laptop x 1	30W	3h	90Wh	90Wh
Coffee Machine	200W	8h	1600Wh	1600Wh
Credit Card Terminal	10W	8h	80Wh	80Wh
Photocopier	75W	8h	600Wh	600Wh
Plug-in chargers and standby loads	30W	24h	720Wh	720Wh
Router	10W	24H	240Wh	240Wh
High efficiency refrigerator (with DC permanent magnet compressor motor)	20W	24h	480Wh	480Wh
Ventilation	30W	24h	720Wh	720Wh
Hot Water heater (boiler)	3000W	2h	6000Wh	
Central heating (on) and water heater (on)	130W	8h	1040Wh (wintertime, gas fired)	
Central heating (off) and water heater (on)	130W	2h	260 Wh	260Wh
High efficiency lighting	200W total	6h (winter)	1200Wh	240Wh
		3h (summer)	600Wh	
Radio	30w	3h	90Wh	90 Wh
LCD TV	50W	3h	150Wh	150Wh
Total summertime baseload, energy conscious small business.				5570 Wh =5.6k Wh

WHY HAVE A GENERATOR?

Some off-grid systems do not feature a generator. If the demands are very low or you have a reliable renewable source you can use a system, such as our EasyGrid range, without using a generator.

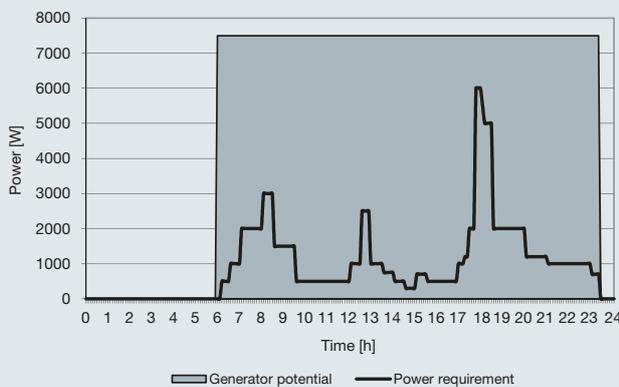
However there are a number of situations where a generator is required:

- Large seasonal variations in renewable energy
- Seasonal changes in energy needs (often you need more power when there is no sun!)
- High peak loads where a generator is required
- A need for having a reliable power source – frozen food, business interruption, heating

Our standard systems are all designed to work with a generator, if wanted. The purpose of the technology in the system is to use the generator only if needed. This minimises fuel consumption whilst ensuring reliable power.

Why is generator loading so important?

The chart below shows the power consumed from a generator that runs 17 hours a day. You can clearly see the amount of time where the loads are very low. This low loading results in very poor fuel efficiency.



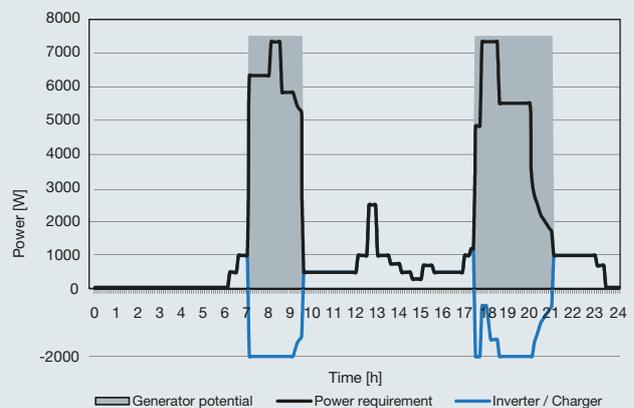
All generators use fuel to just run – even if they are not delivering any power. This means that their actual efficiency is very poor at low loads. We can see this in the table below which shows typical efficiency levels and fuel consumption figures for a 10 kW generator. These figures are summarised from extensive tests performed by Victron Energy in Holland.

Load applied	Efficiency	Specific fuel consumption (grams per kWh generated)	Actual fuel consumption in Litres per hour
0	0%	Infinite	1.06 L/h
0.5 kW	4%	2200g / kWh	1.22 L/h
1 kW	8%	1200g / kWh	1.32 L/h
2 kW	13%	680g / kWh	1.53 L/h
4 kW	22%	400g / kWh	1.91 L/h
6 kW	25%	350g / kWh	2.50 L/h
8 kW	27%	310g / kWh	3.00 L/h
10 kW	27%	300g / kWh	3.73 L/h

The overall efficiency is based on diesel fuel containing 10.8 kWh of energy in every litre. In the table above, at 1 kW, the fuel used in an hour contains 13.2 kWh of energy – however the generator has only produced 1 kWh of electrical output – 7%!

If we take a house with a daily average 15 kWh energy consumption we can estimate fuel usage depending on the power system configuration:

By using a battery system to store the energy you can run the generator at high loads, to get the best possible efficiency, and then use the stored power from the batteries at other times.



GENERATOR OPTIONS

If you are choosing a generator we suggest you consider the following or speak to us about our range:

- **Generator running speed** – Standard generators are built to run at either 1,500 rpm or 3,000 rpm. The slow speed sets will be much more durable as half the engine speed means the unit ‘travels ‘ half the distance every hour it runs. The forces in the engine are also reduced exponentially meaning that it travels half the distance every hour but should also be able to do a much longer distance. A good expectation is for a 1,500 rpm machine to last 4 times the hours of a 3,000 rpm machine.
- **Variable Speed Generators** – A variable speed generator is flexible and can run at any level in it’s range (e.g. 900 - 2000 rpm) this means it provides just enough power for the loads demand.
- **Duty cycle** – generators can be built for occasional ‘stand by’ use where they are expected to only operate a small number of hours a year or for ‘prime power’ where they are expected to be operating long hours – even 24/7. Stand by machines are not designed for the duty expected in an off grid application.
- **Autostart** – An Autostart system is required for the automated off grid systems. An autostart system can take a signal from our system and then correctly take the generator through the pre-heat and crank cycle to start the generator.
- **Fuel efficiency** – Look carefully at the fuel consumption figures at full and half load for the machine you are looking at. Fuel saved can justify spending that bit more on the generator.
- **Heat recovery** – If your property can utilise any waste heat from the generator then you need to make sure you can capture that energy. This will be a combination of jacket water and exhaust gas heat recovery.
- **Fuel system** – Spend money on good filtration and fuel conditioning. Most diesel generator problems are fuel related. Money spent on fuel filtration will be paid back many times!

What we offer



We can offer these with heat recovery and, of course, auto start.

Features

- Four cycle, 3 or 4 cylinder liquid cooled, naturally aspirated, overhead valve, industrial duty diesel.
- Indirect injection with glow plugs for fast cold weather starts.
- Based on heavy-duty tractor engine blocks customised for optimal prime power production.
- With proper maintenance they have logged over 25,000 hours.
- Low torque operating at 1500 at 50Hz, they exhibit less wear and tear than the competitors’ light weight intermittent duty 3000 rpm gensets.
- To ensure ease of maintenance all key service points are on a common side. Low oil pressure and high coolant temperature shutdowns protect your investment.
- Liquid cooled with radiator and pusher cooling fan. Steel radiator shroud and fan guard protects the radiator and operator.
- Four centre-boned mounts isolate vibration.
- Large, replaceable air filter protects engine in dusty environments.

FUEL CONSUMPTION TEST

We carried out a test that simulated the variable loads experienced in many off-grid applications.

The aim of the tests were to look at running costs, not capital costs, to see how much of a fuel saving our systems offer over running a generator 24 / 7

The hardware

We used one of our containerised 8 kW off grid systems with integral fuel tank and 6 kW generator. Then we added a precision fuel monitor from Flo-Scan in Seattle and our iPad interface. We also added a Victron Global Remote Monitoring system so that data on battery capacity and inverter activity could be logged.

The test

We ran the loads from the system and calculated the litres of fuel per kWh of energy used. The energy consumption varied, but bringing the results back to these figures gives a very good indication of relative efficiencies.

The variables

We wanted to test the benefits of adding a very simple energy storage system for overnight 'silent running' and fuller 'automated' control of the generator.

Solar power was also tested. Energy captured from the solar panels means fewer generator running hours and less fuel burnt.

Different battery technologies were also tested. We selected conventional flooded lead acid (Rolls traction batteries) and Lithium Ion (our own 700 Ah 24 volt bank – 18 kWh).

Test 1: Run the generator 24/7 and see how much energy was consumed and how much diesel was burnt. We ran the test for 34 hours and the results were:

	Amount	Value
Fuel burnt	62.5 litres	
Energy consumed	67.1 kWh	
Litres per kWh consumed	0.93	£0.708
Solar Income	0	£0
Overall cost per kWh	0	£0.708

It showed there is a decent amount of saving to go after. Add the replacement costs of the generator and the costs only go up!

Test 2: Run the generator all day (charging a battery and running the loads) and then run the loads from the battery overnight.

This test was performed with Lithium Ion batteries which we anticipated to be more efficient than lead acid (we tested this later). We ran this test for 5 days and the results were:

	Amount	Value
Fuel burnt	42.6 litres	
Energy consumed	62.9 kWh	
Litres per kWh consumed	0.68	£0.515
Solar Income	0	£0
Overall cost per kWh	0	£0.515

Test 3: The third test was based on running the loads from the inverter and only running the generator when it was needed to recharge the batteries. This meant that the generator was loaded heavily when it did run which kept it's fuel efficiency high and the running hours low. We ran the test for 10 days and the results were:

	Amount	Value
Fuel burnt	123.1 litres	
Energy consumed	309.4 kWh	
Litres per kWh consumed	0.49	£0.372
Solar Income	0	£0
Overall cost per kWh	0	£0.372

The test was repeated with a set of brand new Rolls traction batteries and found that this increased the fuel consumption by over 12%. Bearing in mind that lead acid batteries have a steady decrease in performance we would estimate that Lithium would save 15%-20% fuel costs over the course of their life.

FUEL CONSUMPTION TEST

Test 4: Solar power was added to the same set up as in the third test. This meant that the generator only now runs when the solar fails to keep up with the loads and battery charging duties. We used a 3.6 kW peak solar system. Again the generator was loaded heavily when it did run which kept it's fuel efficiency high and the running hours as low as possible. We ran the test for 18 days and the results are:

	Amount	Value
Fuel burnt	132.6 litres	
Energy consumed	473.4 kWh	
Litres per kWh consumed	0.28	£0.213
Solar Income	278.7 kWh (£58.53)	£0.124
Overall cost per kWh	0	£0.09

Test 5: More solar power was added to the same set up as the fourth test. It was increased from 3.6 kW peak to 5.6 kW peak.

Again the generator was loaded heavily when it did run which kept it's fuel efficiency high and the running hours as low as possible.

	Amount	Value
Fuel burnt	6.1 litres	
Energy consumed	58.1 kWh	
Litres per kWh consumed	0.10	£0.080
Solar Income	55.7 kWh (£11.70)	£0.122
Overall cost per kWh	0	-£0.12

Conclusions: The tests show that with the correct mixture of renewable energy it is possible to engineer a system that can produce electricity at a much lower price than from a generator on it's own.

It is possible to cut fuel costs by almost 90%.

The results will vary upon the time of year but these figures give a guide to the costs across the year. Recovering waste heat from the generator will improve energy efficiency further still.

Figures based on test in 2013

BATTERY SELECTION

We offer two types of battery technology with our systems. Understanding the way that different batteries work will help you to choose the best option for you.

Deep cycle batteries

Our default offering is a battery bank formed from deep cycle lead acid batteries. These types of batteries are used in forklift trucks, electric vehicles and other high power, high discharge applications. They are conventional lead acid gel, but are designed to cope with deep discharge levels and repeated cycling. Their life expectancy is 2 - 3,200 cycles giving 5 - 10 years.

Lead acid batteries have two characteristics that are important to this application. The first is that the deeper the battery is discharged on a daily basis the fewer cycles you will get. The best price / performance balance is reached by sizing the batteries so that you do not take them below 50% full.



The next characteristic to consider is the rate that the battery will accept a charge. Lead acid batteries can be charged quickly (approx 15% of their capacity) to 80% charged. After this point the rate that they can be charged at gradually drops. This means that

getting a battery fully charged takes us into the area of really poor generator efficiency! We cope with this by stopping the automated charge on most days at 80%. This means that we are only using the battery between 50% and 80% in the main. This optimises battery life and generator efficiency – but also means that we are only using 30% of the stated capacity of the battery.

The final characteristic that we need to be aware of is the ‘charge efficiency’ of a lead acid battery. We know that we can store energy in a battery. However the bad news is that you don’t get back all the energy you put in. In fact the efficiency is around 90% for a lead acid battery. This means that 10% of all energy generated from a diesel genset or solar system, if put into a battery bank, is lost as heat. Remember, however, that this charging efficiency is much less of a problem than running the generator lightly loaded!

Lithium Ion batteries

Our upgrade option for batteries is Lithium Ion. These batteries carry a significant up front cost. They are available in different formulas, but are used in electric cars, smart phones and power tools. Their life expectancy is 2 - 4,000 cycles giving 5 - 10 years.



Lithium Ion batteries differ in their characteristics from lead acid. They suffer less with reduced life through deep discharge (in fact charge ‘quality’ is the most important issue with battery life). This means that we can use all the stated battery capacity.

The next difference is the rate that the battery will accept a charge. Lithium Ion batteries can be charged very quickly (approx 100% of their capacity) all the way to 100% charged. This means that getting a battery fully charged presents no problems with generator efficiency. This means that we can now use 100% of the stated capacity of the battery.

The ‘charge efficiency’ of a Lithium Ion battery is also dramatically improved – it is 98%. This means that almost all the precious energy generated from a diesel genset or solar system can be used.

The cumulative effect of these differences in characteristics is a dramatic difference in the battery sizing for the different technologies.

If we take a 1,000 Ah lead acid battery as a reference we can calculate the following:

- To optimise battery life and generator loading we operate the battery between 50 and 80% - effectively we use only 300 Ah of capacity.
- Of this 300 Ah of capacity 25% is lost through the charge discharge process. We can either view this as lost energy in or a further reduction in battery capacity to 225Ah.

This means that a 360 Ah Lithium Ion battery offers significantly more useable power than a 1,000 Ah 2 volt battery bank in this type of application.

SAVING EVEN MORE WITH RENEWABLES

So far we have just looked at optimising generator usage. However we can save yet more precious fuel by integrating renewable energy into the system.

Solar

Solar panels generate DC power that can, via a solar regulator, charge a battery. However we can replace a solar regulator with a solar inverter that will convert this DC power to 230 V AC. This power can then be fed, via a power meter, to our system where we can use it to run household equipment or charge the batteries.

A 4 kW solar system will generate approximately 4,484 kWh per year. This could save you 1,500 litres of fuel if you could use all the solar energy generated. In reality

there will be periods in the summer where the system generates more than you use so assume that you will only realise 65% of the fuel saving.

Of course you will find the generator running more hours in the winter when the days are short and the sun low in the sky. However there will be days in the summer when the generator will not need to run at all. We have a system in use in a 3 bedroom remote house and a 4 kW solar system where the client has recorded weeks in the summer with less than 2 hours generator run time.

Wind

All EasyGrid systems have an upgrade option that allows owners to integrate a wind turbine as part of their renewable power input either at time of order or retrospectively. Whilst solar arrays are a good source of renewable power, wind turbines can also deliver valuable

additional energy. Solar power can produce great results when the sun is shining but that may be only for a few hours a day, particularly in the UK. A wind turbine, whilst it may not be as powerful, can be producing power at any point during the course of 24 hours.

By integrating this additional renewable source, owners can further reduce generator run time and running costs.



EASYGRID

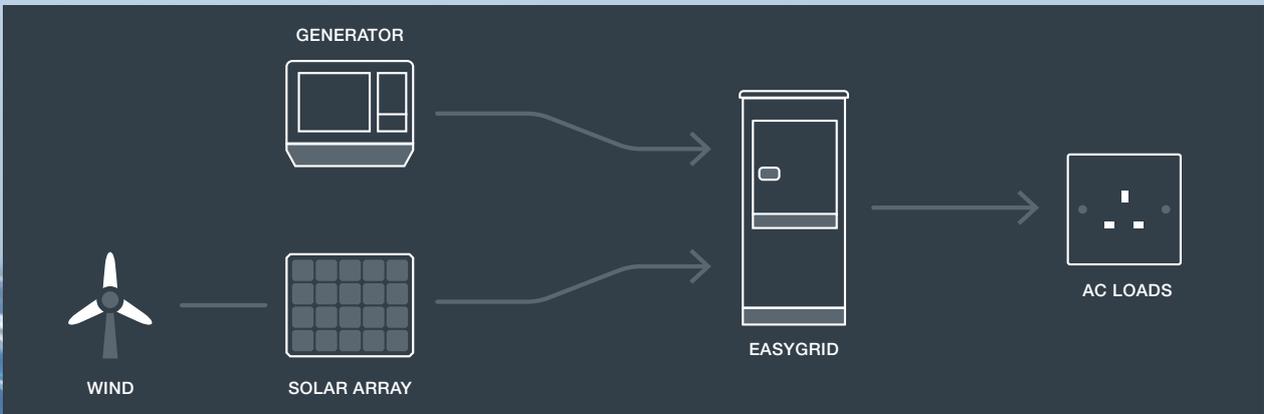


EasyGrid 3000, EasyGrid 5000, EasyGrid 10,000

Our EasyGrid range brings off grid power solutions to homes and businesses without a mains grid connection, at a reasonable cost. Rather than having to source separate components and have a bespoke system designed, our EasyGrid series offers a pre-configured, self-contained unit built from durable, high quality components; fully tested and ready to install. The enclosure is made from powder coated steel and is fully lockable; allowing it to be installed either outside or within an outbuilding, depending on requirements. Suitable for installation worldwide the EasyGrid range addresses off grid power needs for both UK and International customers and can be installed by a competent local electrician.

How does it work?

The unit connects to your solar array and also has a connection for a generator. Energy from the solar array is used to charge the batteries, where energy will be stored until needed. The array then tops up the batteries as the power is used. If a generator is connected and the batteries are depleted and no solar power is available, the system will send a start signal to the generator to provide power.



What can you run with a EasyGrid?

It is always difficult to define exactly what you can run from an off grid system – average demands can be easy to manage but peak loads can be more challenging to assess. The EasyGrid units are designed to run (without a generator) the following loads:



EasyGrid 3000 - Residential Example:
2 bedroom home with gas cooking and energy efficient appliances.



EasyGrid 5000 - Residential Example:
3 bedroom home with gas cooking and energy efficient appliances.

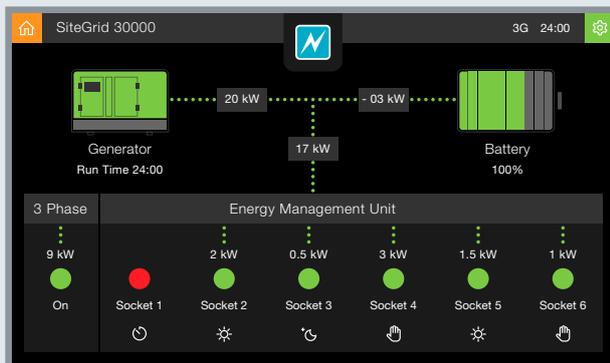
EasyGrid 10000 - Residential Example:
5 bedroom home with electric cooking & efficient appliances.



SiteGrid offers a convenient and efficient method of delivering power to any site environment without a grid connection. If a site needs power for lighting, a welfare cabin or equipment SiteGrid will deliver power far more efficiently than a generator alone.

SiteGrid utilises generator power, and renewables if available, to store power in a sophisticated battery bank with a dedicated monitoring & control system, delivering silent power from the battery when needed. The generator will only be started when loads demand more power or to top up the battery. Significantly reducing emissions, the size of generator required and fuel costs.

SiteGrid – Off Grid Power Systems 30kVA & 45kVA Single and Three Phase options



Energy Management Unit (EMU)

SiteGrid features an optional Energy Management Unit (EMU) to bring more sophisticated control for sites with a variety of power requirements. The EMU allows six separate loads to be fed from the unit and programmed with their own unique schedules. For example – one feed could be for security lighting that is triggered by the in-built light sensor, another could be for the drying cabin that does not need to be heated during Saturday and Sunday. The EMU system allows businesses to further reduce their emissions by using intelligent power planning, in addition to reducing fuel costs and generator noise.

Hybrid Power Improving Air Quality

An increasing concern in built up areas and construction sites are the particulate and NOx emissions from diesel generators. Our hybrid power units reduce the run time

of generators substantially – therefore cutting down these emissions. Whilst a hybrid system does not stop generator use completely, they make a significant difference to the local air quality, which is a benefit for both onsite staff welfare and local residents.

Overload Protection

To prevent the inverter from being overloaded in high demand periods, the system monitors the size of the load and its duration and calculates if a generator start and assist is required.

Silent Period

This is a user-defined period, such as night time, which restricts the generator from running. However, if the batteries become discharged below a safe level, then the generator will automatically start up, and run until they are at a safe level.

Battery Monitor Synchronisation

In order to maintain the accuracy of the battery monitor measurements, the system will track the time between full charges. If the battery has not been fully charged for more than a week, the generator will run until a full charge is achieved. This will be combined with the end of day top up charge to minimize the amount of additional generator running time.

VARIPOWER



Variable speed hybrid power system

VariPower is a variable speed generator combined with a highly efficient battery bank. Developed, designed and manufactured in the UK. The unit provides transportable, instant power for temporary, back-up and off grid situations in any environment.

Unlike traditional generators which only run at one speed whatever the load demands, the variable speed generator combines the latest control technology and PMG alternator and will run at the most efficient RPM (between 900 – 2000) dependent on the energy requirement; providing just enough power for the load and to charge/top up the batteries without any waste.

When demands are low the generator will run at just 900 RPM, producing very low noise, using less fuel,

and less CO₂ and NO_x. For times when a higher load is demanded the generator can move up in speed to anything up to 2000RPM; delivering higher amounts of power, quickly and efficiently.

The batteries within each unit act as an energy store; so at times of very low demand, or when completely silent power is required, the batteries alone can run the load, the generator will not need to start at all. At this point no fuel is used and emissions are at zero.

The built in intelligence of the system means the VariPower provides power in the most efficient way possible without the need for user intervention.

VariPower – the unit

- Powder coated steel enclosure - resistant to wind, sun and rain. Suitable for extreme environments.
- Renewables – the units have an option to be linked to a solar array thereby reducing costs and emissions even further.
- Built in fuel tank with 110 litre capacity means reduced refuelling requirements. External fuel tank connectors are also fitted as standard.
- Easy access – one side opens up for easy engine servicing, fuelling and electrical connections, making it convenient and accessible even on busy sites.
- Lockable and secure – gives peace of mind to owners.
- Forklift pockets, central lifting hook, strapping points make moving the units easy and secure.



Perfect for a range of applications

VariPower has been designed to address a range of markets, from temporary sites to permanent off grid situations.

VARIPOWER



Battery Storage

The standard unit comes with 15kWh of battery storage (nominal) using the very latest lithium technology. The battery storage can be expanded up to 45kWh (nominal) as an option.



Perkins Engine

VariPower uses the Perkins 404D-22 – a powerful but quiet 2.2 litre naturally aspirated four cylinder compact engine designed to meet EU Stage IIIA/U.S. EPA Tier four interim emissions standards.

Control System

The proprietary control system offers a straightforward way to operate and control the VariPower.

The display screen allows monitoring of all the relevant data from the engine, batteries and power electronics. This information can also be viewed remotely via an optional 3G internet connection allowing the reading to be seen on a tablet, PC or smart phone.

The simple design makes it perfect for use in fixed, rental and temporary environments, whilst the remote access gives the flexibility for owners to see the data from the unit wherever they are.



CONTAINERISED



Our containerised hybrid power system is an ideal solution for those needing deployable power, emergency power, back up power or sites with no grid connection.

The system uses sophisticated control technology, options for links to renewable power sources, highly efficient generator power and energy storage in lithium ion or Gel/AGM batteries.

This stand alone hybrid system is being installed in situations from national parks to coastal power - with each system being semi-custom designed to suit each application. A perfect option for more challenging environments our containerised off grid systems offer a highly effective way to get power to the right places.

A typical containerised system has the following specification:

- 8kW - 45kW Single and Three Phase options available
- Inverter charger with a continuous output meeting the system capacities above.
- Diesel, water cooled, 1500 RPM (or 1800 RPM for 60 Hz applications) generator (single or three phase as appropriate) in sound enclosure with autostart control system.
- Steel, bunded, diesel 'floor' tank with mechanical and system fuel gauges.
- Recessed connection box for outgoing power, auxiliary connections and external controls and indications.
- Lithium Ion battery pack or Lead acid deep cycle battery bank. (Lithium system offers superior energy performance due to low battery losses and also optimises fuel consumption and generator running hours as it can be charged fast to 100%)
- Solar ready
- DC and AC distribution boards
- DC lighting inside container

Maximise renewables

Our proprietary control system maximises renewable use (if fitted), minimises fuel consumption and reduces generator running hours. All designed to keep cost per kWh of energy used as low as possible.

Flexibility

Deployable or fixed our containerised hybrid unit offer quick and simple installation as well as a secure, weatherproof area for client equipment.

CASE STUDIES



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