



The hybrid generator revolution

Powered by know-how



victron energy
BLUE POWER

The hybrid generator
revolution

Powered by know-how





HYBRID GENERATORS

How can an already efficient generator save 80% fuel?

The solution is powered by know-how. Thanks to our large range of industry-leading inverter/chargers, lithium batteries and our VRM monitoring platform, incredible cost savings can be achieved whilst increasing power security and significantly reducing emissions at the same time.

With over 45 years of experience, we've learnt what it takes to build battery-based power systems that stand the test of time and withstand the environment. Our customers value the reassurance that our power solutions deliver knowing they have our worldwide network of authorized dealers by their side. They know we don't cut corners, they know our family-run business is built on a foundation of trust they can always depend on.

Energy. Anytime. Anywhere.









Index

- 4** Introduction
- 10** The hybrid generator revolution explained
- 12** Traditional generator vs hybrid generator
- 16** System example
- 20** Experience the power of VRM - remote monitoring
- 22** Expert stories with Andy Perry
- 24** Customer stories
- 26** Lithium vs Lead-acid batteries
- 28** How to get started
- 30** Technical drawing of a Hybrid Generator system
- 32** Flexible building blocks for any kind of power challenge
- 36** Why Victron Energy



Connections. Powered by know-how.

When you want to make significant savings on refuelling telecom generators without reducing performance, it's good to know the power of know-how is by your side.

Calculate your potential savings using our VRM generator report and join the Hybrid Generator revolution.

Energy. Anytime. Anywhere.



victron energy
BLUE POWER

HYBRID GENERATORS

The hybrid generator revolution explained

Hybrid generators don't just beat traditional generator-only installations in the business sense - they're better in virtually every other imaginable parameter. A hybrid system significantly reduces fuel consumption, emissions, noise, service intervals and overall logistics while providing uninterrupted clean power at all times.

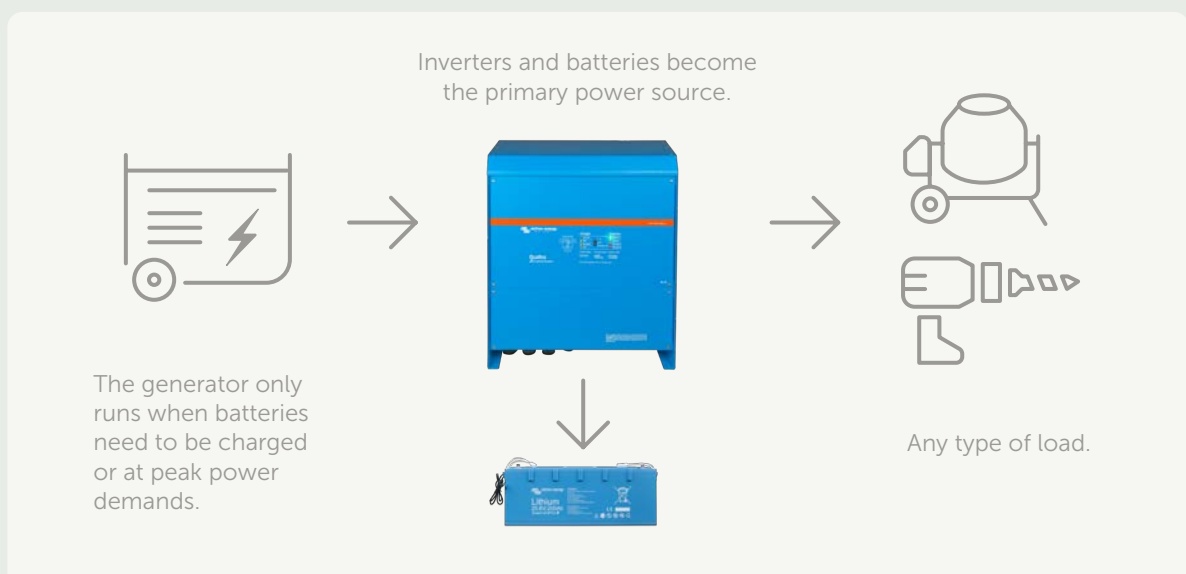
Let's see how the two setups compare in greater detail.

Traditional generator

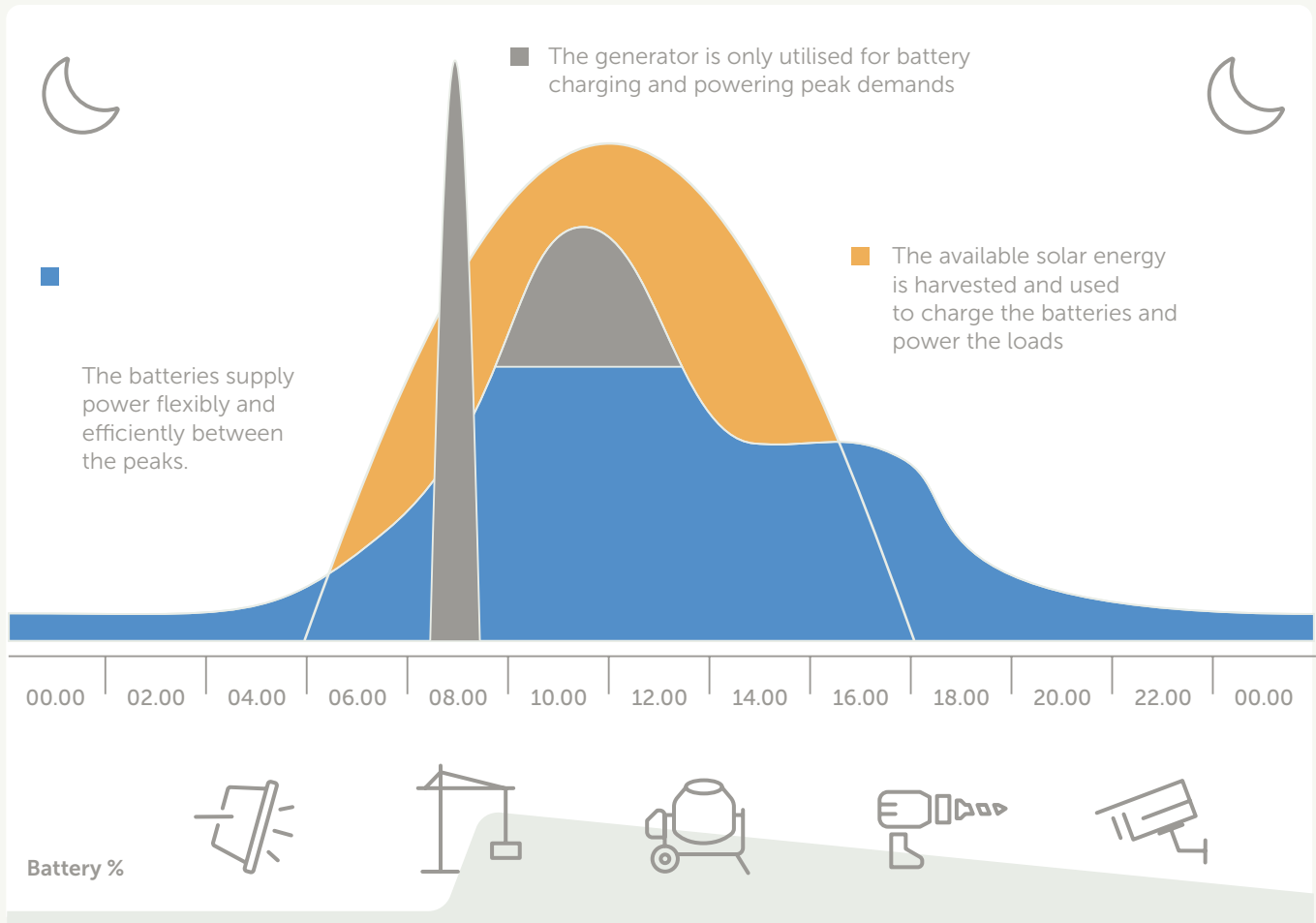
A traditional generator needs to burn fuel to be able to produce both a certain voltage level and maintain a fixed frequency. For a medium sized generator this can be several litres per hour, even at no- or low-loads. The generator size is typically chosen for the worst case scenario so full capacity is only demanded 5-15% of the time. This means the overall efficiency is far from perfect.

Hybrid generator system

A hybrid system with inverters follows the exact power demand of the loads, with the batteries supplying as much power as is required at any given time. Even when idle, the inverter system works extremely efficiently thanks to their minimal self-consumption. This means that it becomes much more efficient to let the inverter take the primary role in powering the loads for most of the time. In this setup, the generator only needs to be started when there is a peak power demand or when the batteries need to be charged. The inverter's high peak power capability ensures that heavy machines and variable loads can be powered problem free..



Best of both worlds



By powering your loads from a system using both inverters and a generator you get the best of both worlds: an extremely reliable power source which also significantly reduces emissions, noise, maintenance and fuel consumption - we have seen reductions of over 80%.

Our advanced remote monitoring portal VRM can optimise matters further. By fine-tuning battery usage, generator running times, planned refuel periods and predicted service intervals running costs can be reduced to a minimum.

Efficiency at scale

Large fleets can be proactively monitored and managed at a glance. Identical product settings can be cloned and distributed remotely. A variety of systems with different capabilities can be offered thanks to our range of flexible, modular power products that connect together in custom configurations, like only we know how.

HYBRID GENERATOR COMPARISON



From a traditional generator system



To a more efficient hybrid solution...

Generators need to be sized for the maximum expected peak power.



The hybrid generator system can be sized for the average expected load, allowing the generator to be downsized as it is primarily used to charge the batteries. With a hybrid setup, customers can often choose a smaller generator size, resulting in investment savings, improved fuel economy and improved logistics.

Generators produce noise and emissions 24/7.



With a hybrid generator, the generator run-time is significantly reduced and even a 'generator quiet time' can be configured when working in a noise sensitive location such as an urban environment.

Service intervals required on location every X hours.



Significantly less generator run-time results in reduced wear and tear, longer service intervals, and less maintenance downtime.

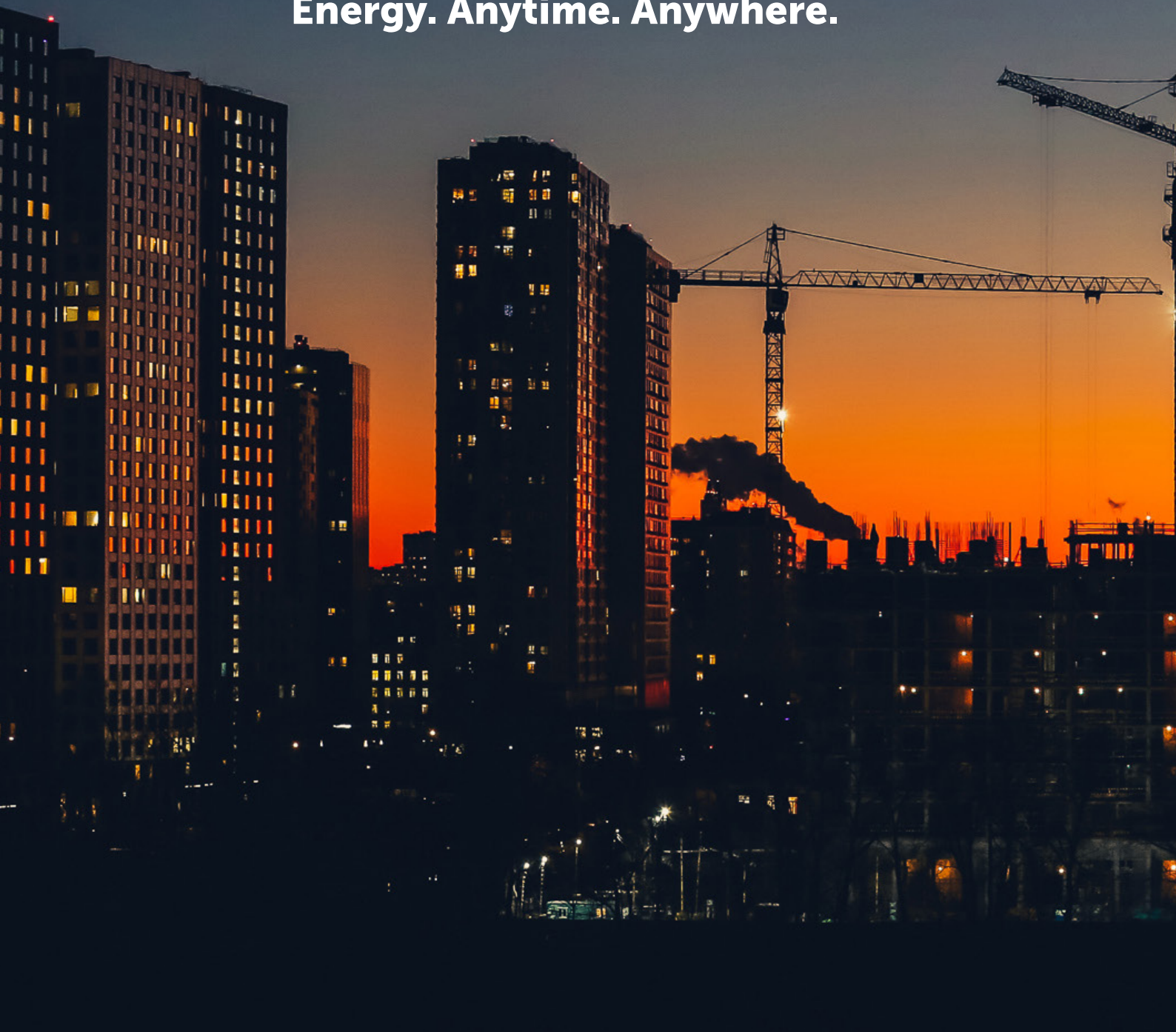


Cost savings. Powered by know-how.

When you need reliable 24/7 power on your construction site, without 70% fuel waste, it's good to know the power of know-how is by your side.

Calculate your potential savings using our VRM generator report and join the Hybrid Generator revolution.

Energy. Anytime. Anywhere.





victron energy
BLUE POWER

SYSTEM EXAMPLE

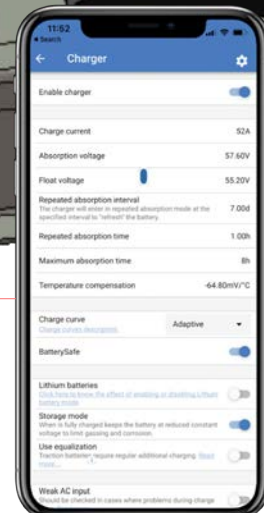
Modular hybrid generator setup 45kVA

Quattro inverter/chargers power three-phase 400V industrial appliances from the battery bank.

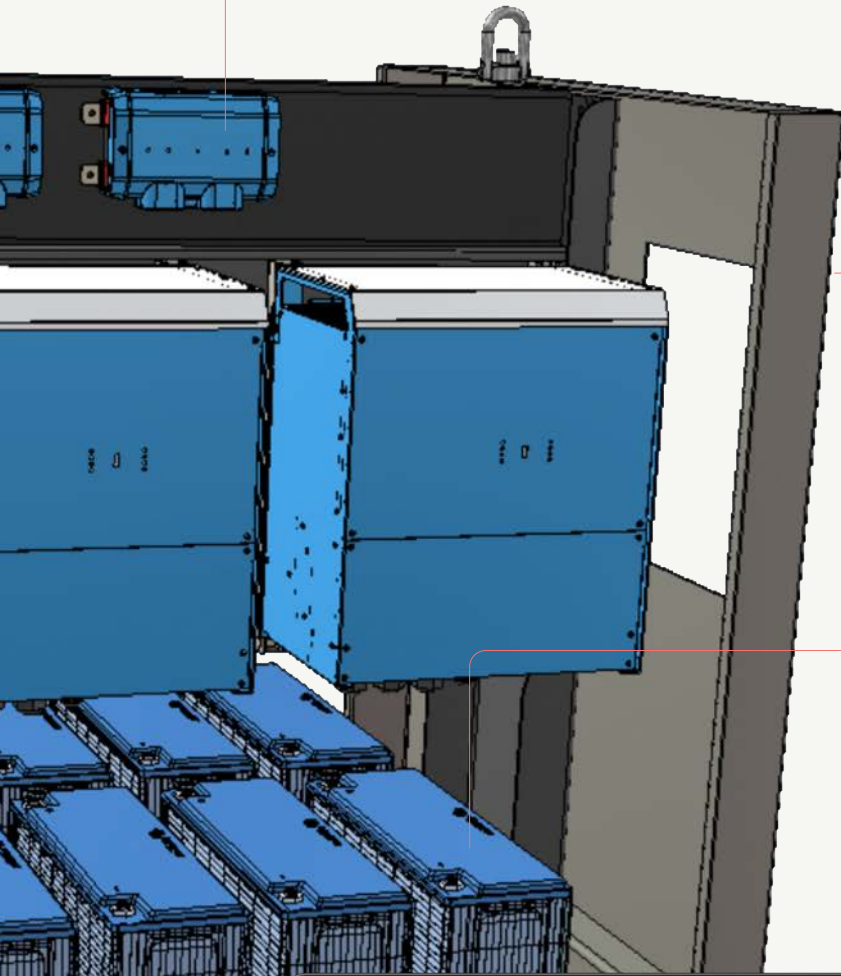


Cerbo GX: enables VRM - remote monitoring, optimises the systems performance and starts/stops the generator to charge the batteries when needed. Its GX touch display gives an instant overview of the system and lets installers modify system settings. The Venus operating system software allows working with Node-Red to build detailed automated flows based on any data point.

VictronConnect: easily configuring, cloning and commissioning of hybrid generator systems.



Lynx distribution system: the Lynx distributor is a modular busbar and connects all the loads or batteries and enables remote fuse monitoring. The Lynx BMS is a battery monitor, has a built-in contactor and communicates with a GX-device.



Solar chargers and panels can significantly add to the stand-alone time for systems at hard-to-reach places and increase fuel savings as every kWh of solar energy roughly saves a litre of diesel fuel.

Lithium Battery Smart: robust heavy-duty battery with a high charge and discharge capacity for extreme performance.



VRM - remote monitoring: Monitor complete energy systems, tanks and temperatures remotely. Proactively monitor and manage hundreds of installations and offer service contracts to customers.



Scaling up. Powered by know-how.

When you need to operate a fleet of hybrid generators at maximum efficiency, it's good to know the power of know-how is by your side.

Optimise your fleet remotely with VRM
Check victronenergy.com/vrm

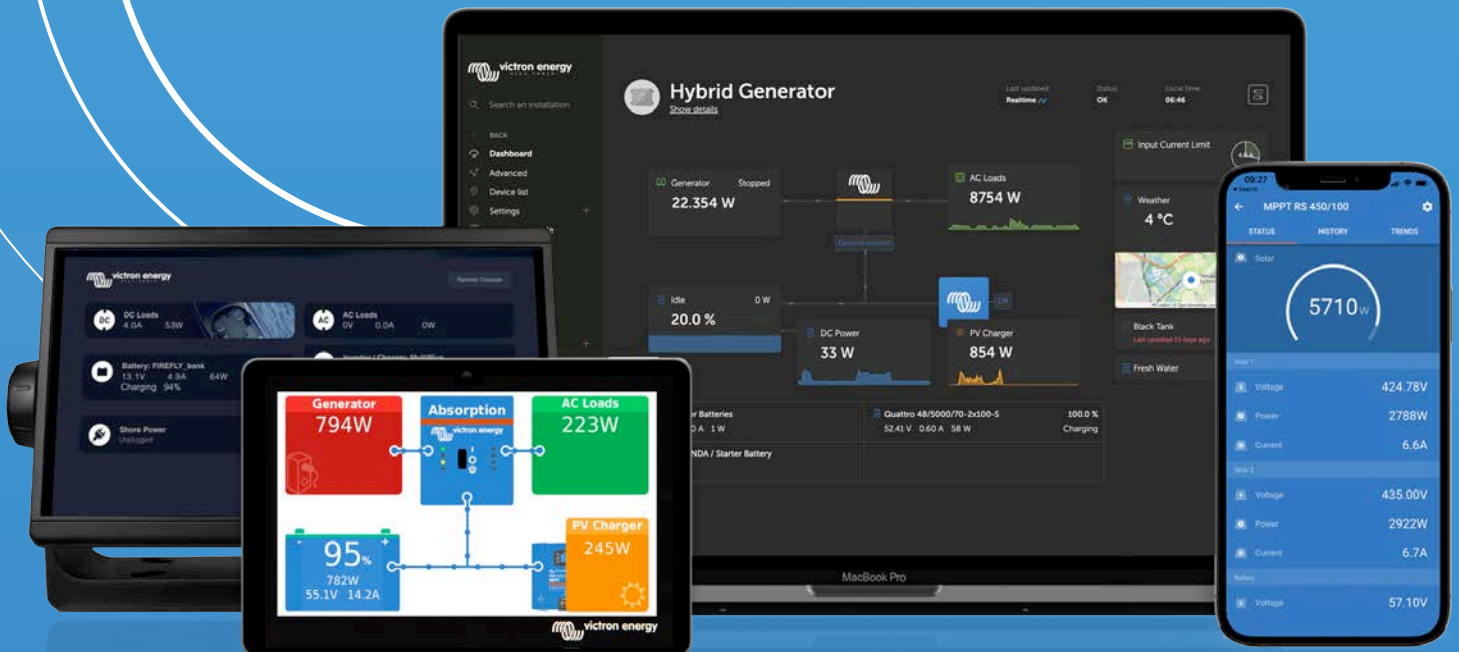
Energy. Anytime. Anywhere.



Experience the power



VRM - Remote monitoring



Create new business models and assist customers better by offering remote assistance and pro-active maintenance services. Stay on top thanks to push notifications and prevent issues before they happen. Scale up your business and manage entire fleets with ease.

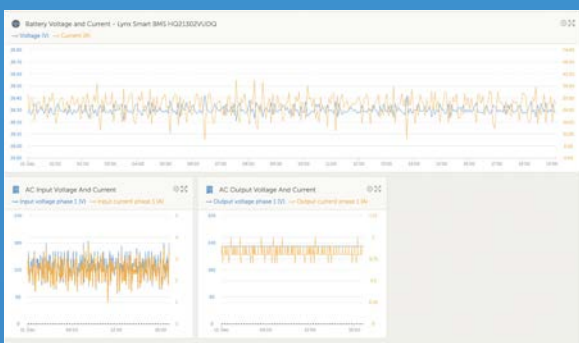
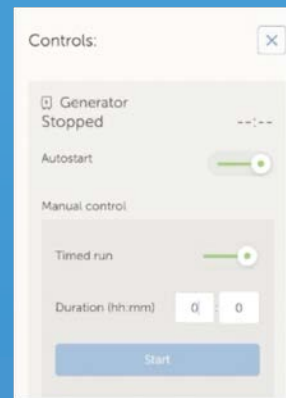
See our VRM - remote monitoring portal in action at victronenergy.com/vrm



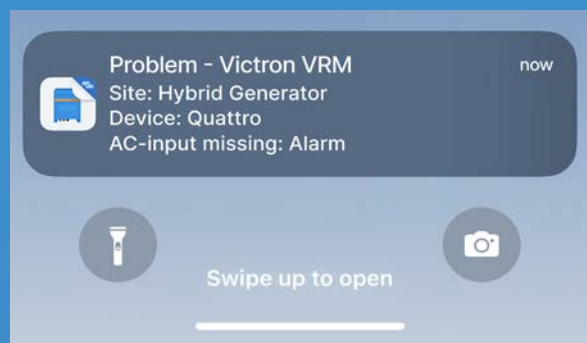
Monitor hundreds of systems at a glance, including their tank levels, temperatures and location from wherever you are.



Easily control and plan generator run times or optimise any setting remotely.



Analyse historical data and resolve challenges remotely.



Receive push notifications on custom alarm triggers to prevent issues from happening.

Energy. Anytime. Anywhere.

EXPERT STORIES

Andy Perry, co-founder of Power Saving Solutions Ltd. and Hybrid Generator ambassador for Victron Energy.

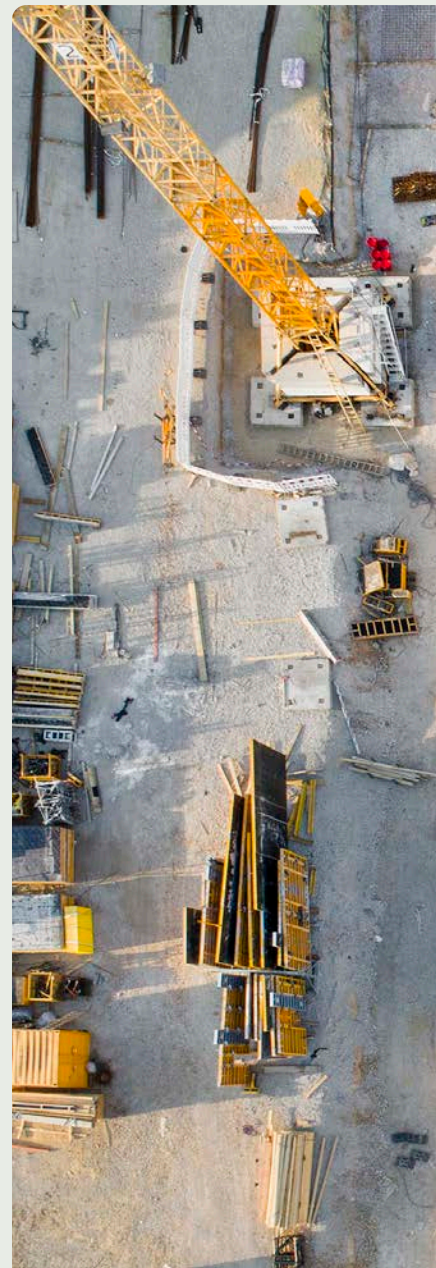


In a highly competitive rental market for hybrid- and battery generators, we focus on providing customers with energy-saving solutions that can make a real difference. We help our customers 24/7 to save costs, reduce emissions and noise pollution; an increasingly important factor when working in urban environments. Victron Energy products not only help us build cost-competitive and highly reliable systems, it's their VRM monitoring platform that proved to be a total game changer for us.

Detailed insights in the power behaviour of our customers on-site enable us to further increase their savings. For example, if we see large loads only being used in the morning, we might suggest leaning on battery power earlier in the day, which further reduces generator time. A quick top-up at the end of the day then takes the system through the night, of course in complete silence.

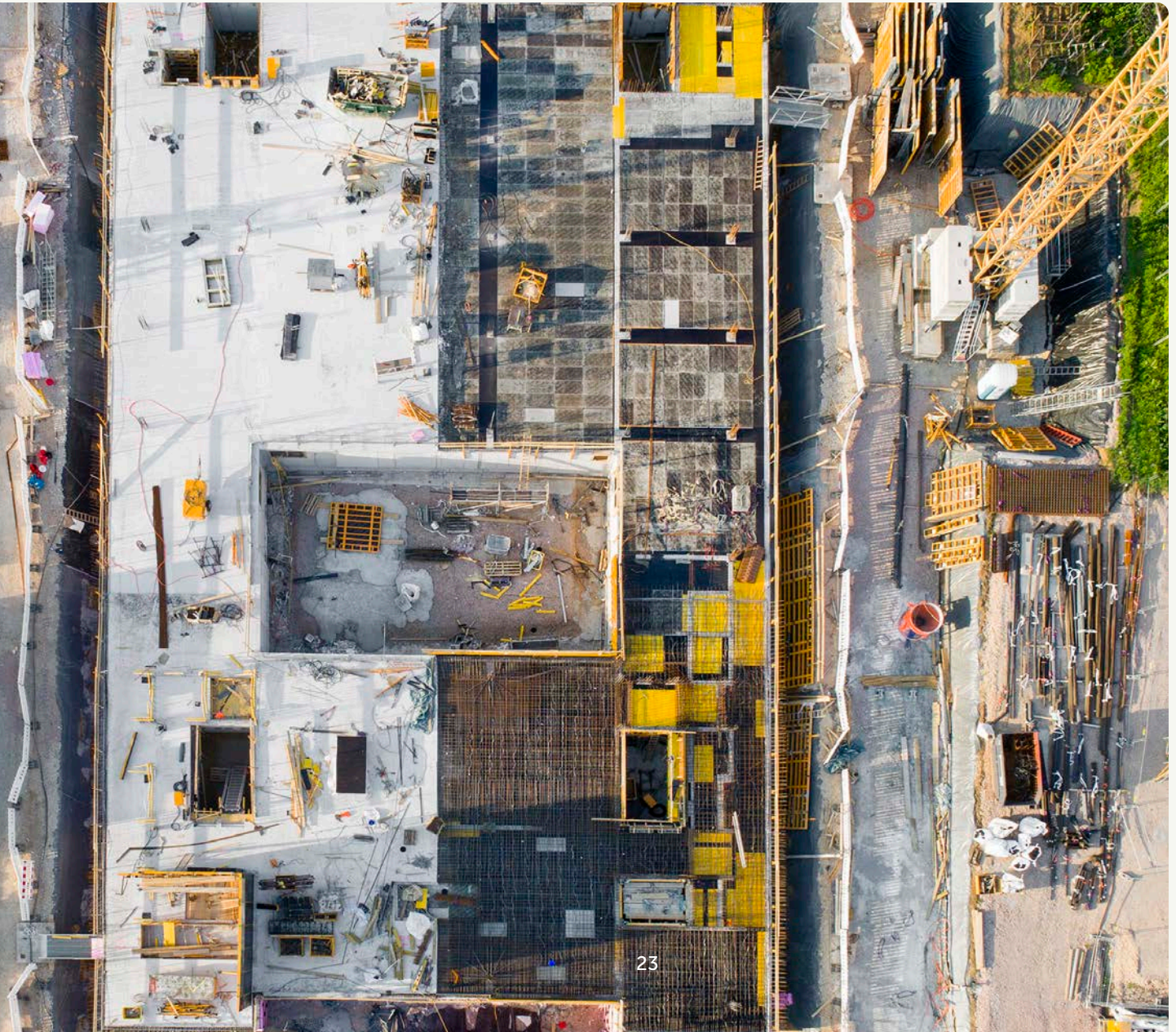
When we see the night usage increasing resulting in lower battery state-of-charge percentages, it's easy for us to argue for adding a secondary unit, which even can be paralleled if needed.

“Reliability means profitability”



VRM's custom widgets and configurable push notifications help provide a safety net that allows us to be pro-active and prevent issues from happening. We know immediately when a generator isn't coming online at a time where it was programmed to start charging, or when the state of charge is too low. A quick look at the data then helps to rule out other causes and with a quick call to the site to check the genset can prevent a total outage.

On another level, learnings from data also help reduce capital expenditure for customers renewing their generators. Here VRM helps to identify the annual average peak power output, which determines the ideal size for the new generators. This often leads to choosing smaller gensets, which of course run more efficiently but are also cheaper, which saves investment budget.



CUSTOMER STORIES

Generator hire company powers their office through their gen-set load tests

Gijssels BVBA, Belgium, operate a rigorous generator testing regime during which the units are run under load for an hour to ensure they are performing satisfactorily. The energy is used to charge a hybrid system that powers their workshop and offices 24/7.



Units tested.
Power banked.



[Read more](#)

Battery generator as buffer to the grid

MobilHybrid's battery generator safely powers an electric crane for months, without causing issues to the grid. Energy providers are increasingly limiting the grid connection performance and sometimes prohibit temporary connections. With MobilHybrid's MH24 peak loads of up to 125A are now buffered from the battery generator and thus there are no critical network effects. The high performance batteries can be charged from the grid with powerful Quattro inverterchargers in 2 hours, eliminating the need for a generator and its fuel consumption, resulting in an ROI of under one year.



Read more



LITHIUM VS LEAD-ACID BATTERIES

Increase cost-efficiency and performance with Lithium batteries

In addition to economic reasons, where Lithium batteries have a better cost-per-cycle in the long run, the performance advantages are also significant, especially in case of hybrid generator systems.

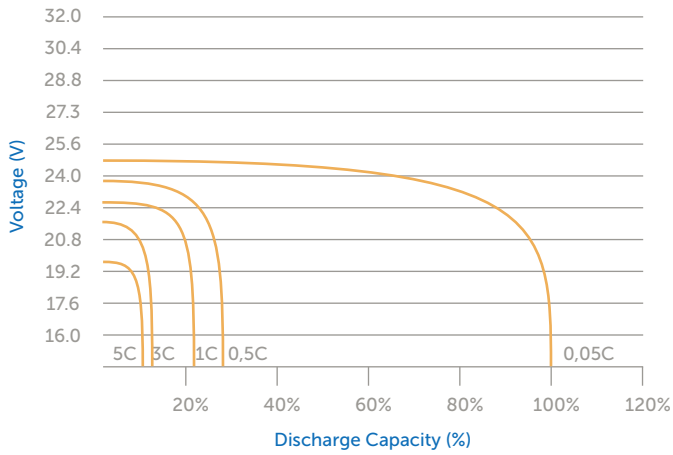
Lithium batteries can be charged faster and have a higher round-trip efficiency, which leads to a much better generator fuel-economy.

High discharge currents do not impact the battery's overall capacity and there are no significant voltage drops which means the inverters can keep working at maximum performance and efficiency.

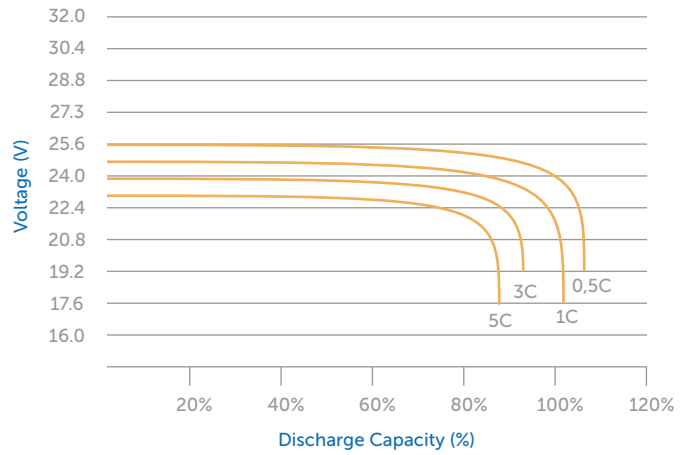
Besides performance aspects, their low weight, size and high energy density are perfect from a logistics point of view.



Lead Acid



Lithium



How to get started?

Step one:

In VRM's reporting section, create a hybrid generator report. This will calculate the reduction in run-hours and the cost-savings associated with lower fuel consumption. Add the current maintenance analysis and related costs for the full picture.

Step two:

Identify the perfect system and generator size in line with the battery bank (45kWh battery bank = 45kVa generator) and calculate the return on investment.

Step three:

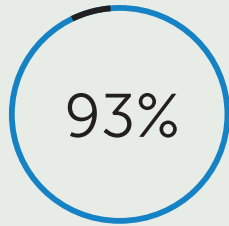
Build and configure the system, create custom alarm notifications in VRM.

Step four:

Monitor the system's behaviour in real-life and fine-tune its settings with VRM. Use accumulated on-going data to optimise your cost savings.

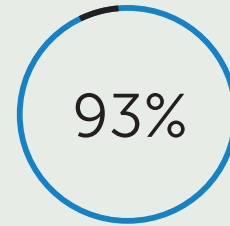


Reduction in run-hours



Number of days	35
Fuel consumption per hour	1.4
Cost of fuel per litre	£ 1,94
Normal run-hours for this period	840:00
Actual run-hours for this period	57:39
Reduction in run-hours for this period	782:20

Reduction in fuel consumed



	Run-time (hrs)	Cost (£)
Conventional generator	840:00	£ 2.281,44
Hybrid generator	57:39	£ 156,61
Fuel saved		£ 2.124,83

Fuel costs saved
£ 2.124,83

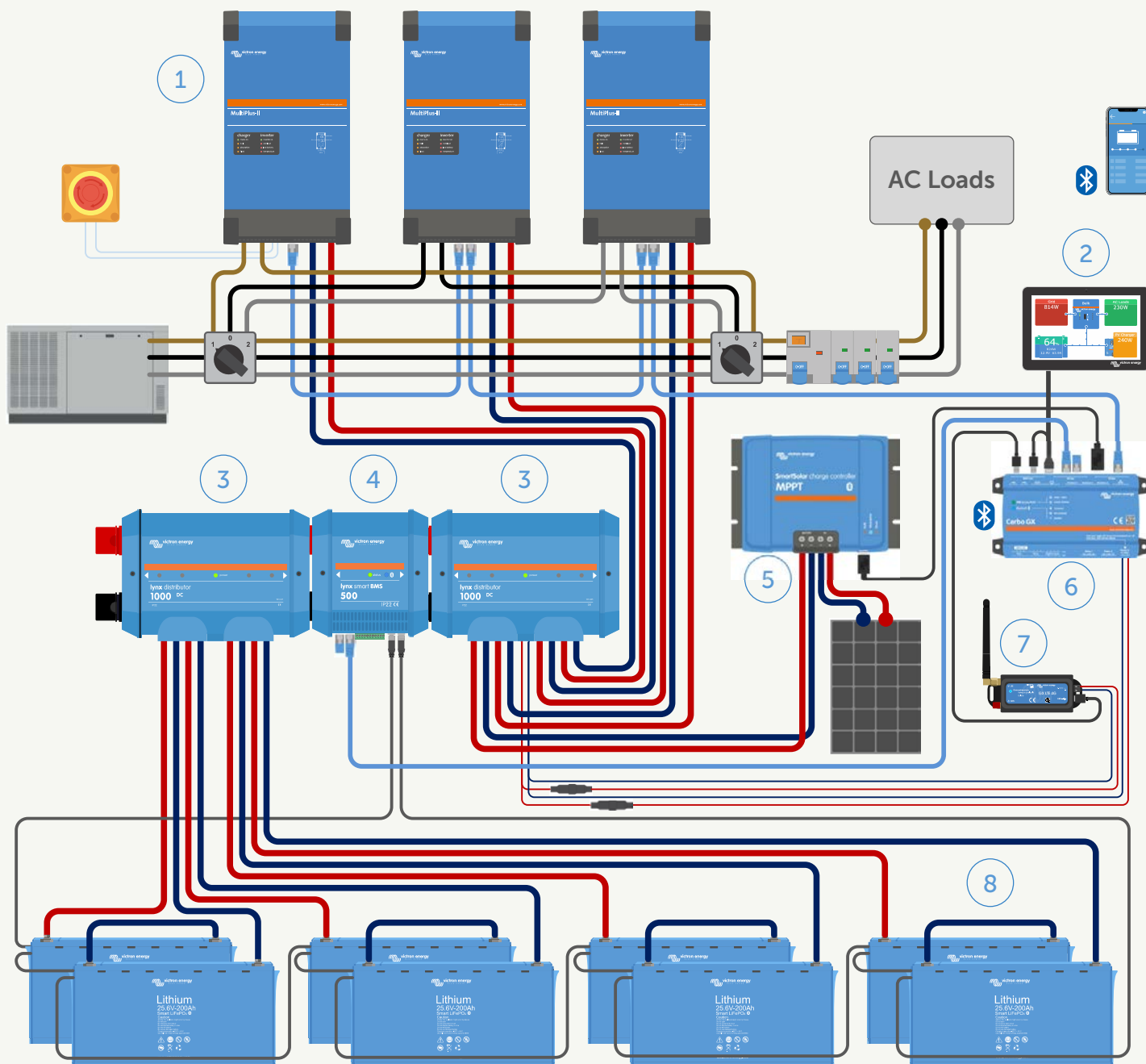
CO₂ savings
2891.53 kg














Feel free to contact a Victron Energy expert, distributor or sales manager for more information. Check www.victronenergy.com/wheretobuy or email to sales@victronenergy.com with your request.



HYBRID GENERATOR SYSTEM





ID	ITEMS AND NOTES		
①	Quattro or MultiPlus inverter/chargers , 3 units, configured in 3-phase, creating an uninterruptible power supply.		
②	GX Touch , touch screen to display system information, available a 5 or 7 inch model.		
③	Lynx Distributor , a modular busbar system with integrated DC fuses and fuse monitoring.		
④	Lynx Smart BMS , battery management system for Victron Lithium batteries, with integrated battery monitor and DC contactor.		
⑤	SmartSolar MPPT solar charge controller , available in models ranging up to 100A, multiple units can be paralleled.		
⑥	Cerbo GX , for system monitoring, control, and remote access. Communicates with the VRM portal and VictronConnect app .		
⑦	GX LTE 4G , a 4G modem and GPS accessory for the for the Cerbo GX.		
⑧	Lithium Battery Smart 26.5V 200Ah , 4 paralleled pairs, creating a 800Ah, 48V battery bank.		
	Positive (red) and negative (black) DC cables. For the correct cable sizing see the Wiring Unlimited book.		
	Lithium Battery Smart BMS communication cable is attached to the battery. Extension cables are available.		
	3-phase AC and AC circuit breakers (CB or MCB) and AC earth fault detector (RCD, RCB or GFC).		
	Generator, 3-phase.	 AC Loads	3-phase AC loads.
	Phone with the VictronConnect app communicating via Bluetooth.		AC transfer switch.
	RJ45 UTP cable, available in lengths ranging from 30cm to 30m.		RJ45 terminator.
	VE.Direct cable is available in lengths ranging from 30cm to 10m.		Emergency switch.
	DC fuse.		Solar array.

HYBRID GENERATORS

Flexible building blocks for any kind of power challenge

With Victron Energy you have one of the widest ranges of robust power products that keep performing even in the harshest of climates. Hybrid generator systems can be built to any specification to meet the smallest requirement - up to the most demanding industrial applications and everything in between. Virtually unlimited power can be offered through parallel, split- or three-phase operation.

Due to the modular nature of our components, increasing the system size is fairly simple. Easily add more inverter/chargers and batteries and configure accordingly. Where possible, add solar chargers as each kilowatt of solar energy saves roughly one litre of fuel and can add significantly to the autonomy and cost-effectiveness of the overall system.

Easily configure and clone products with the VictronConnect app and stay in perfect control, remotely, thanks to our VRM - remote monitoring portal. Build hybrid generator systems exactly to your needs and see how more than 45 years of experience translates into an unbeatable system that is powered by know-how.



Quattro

- Multifunctional pure sinewave inverter
- Two AC-inputs with auto source select
- Uninterrupted AC power - UPS function



Lithium Battery Smart

- Rugged, heavy duty battery with excellent round-trip efficiency
- High charge and discharge capacity for extreme performance
- Integrated cell-balancing





Inverter/chargers in a large variety of models and sizes



Solar chargers



DC distribution systems

Battery Management

Lithium Smart Batteries



System monitoring



VRM - remote monitoring portal

And more

Battery protection - DC-DC converters and chargers - Lithium batteries - AGM and GEL batteries - Smart Battery monitors - Voltage sensitive relays - Fuses and fuse holders - Busbars - Battery switches



Greener fleets. Powered by know-how.

When you need to electrify your fleet and instantly reduce emissions, it's good to know the power of know-how is by your side.

Electrify any business with the largest range of robust power products. Check [victronenergy.com](https://www.victronenergy.com)

Energy. Anytime. Anywhere.



Why Victron?

At Victron Energy we're as dedicated and driven to making and improving power solutions today as we were when we started in 1975. Thanks to our customer feedback, data and knowledge sharing, we innovate 24/7. We are powered by know-how, it keeps us going and our users going, ensuring peace of mind in off-grid for years to come.

01



It's not one thing that makes it all work.

Our modular, robust and connected power systems have been proven to deliver unequalled reliability time and time again, even in the harshest of climates. But it's our unique combination of up-to-date hard- and software, intelligent monitoring apps, the network of highly trained authorized professionals and widespread repair centers that turns a Victron Energy system into an unbeatable system, that is powered by know-how.

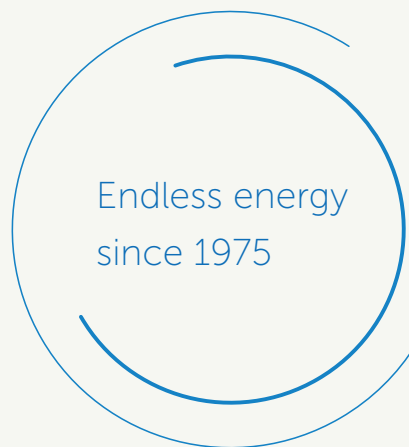
02



Reliability powers long service life cycles.

When making power supply investment decisions, calculations purely based on price can be deceptive. Their true performance and expected service life cycle are equally important. Good thing Victron Energy lives up to our specifications, both in terms of performance and expected life cycle (when used as designed). Our 5 or 10 year warranty and fair and fast repair policies mean your investments are protected and won't let you down.





03



How efficiency translates into cost-effectiveness.

With battery-based systems, efficiency is always key to providing great levels of cost-effectiveness. From our incredibly efficient SmartSolar Charge Controllers to the way our inverter/chargers can intelligently control and minimise generator use, with a Blue Power system you can be sure that all the details are thought-through. This, combined with our reputation for extreme resilience and long life cycles, translates into cost-effective solutions, especially when compared to 'cheaper' options.

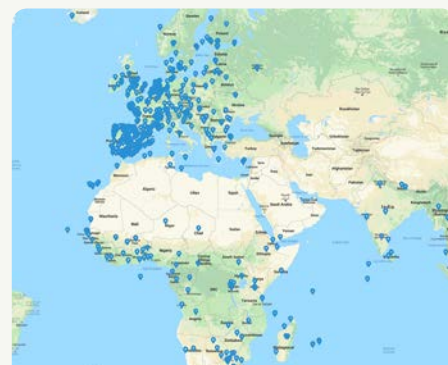
04



Intelligent monitoring means optimized systems.

Monitoring is crucial to fine-tune and optimize energy harvest and use based on ever-changing circumstances. With Victron you have the power of know-how at your fingertips. Through our industry leading and free VictronConnect app, you always have perfect control over your system from wherever you are. With our app and VRM portal you can monitor the complete system, change settings and catch potential issues early by programming alerts and alarms.

05

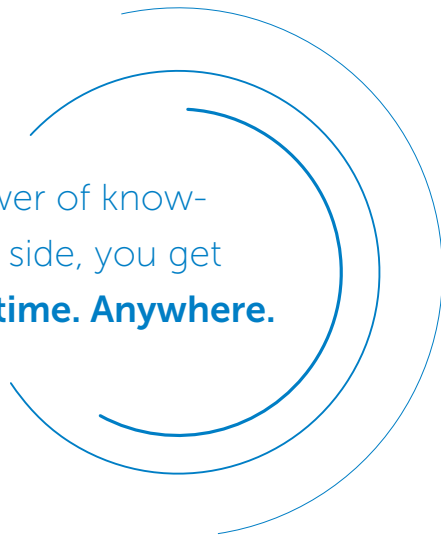


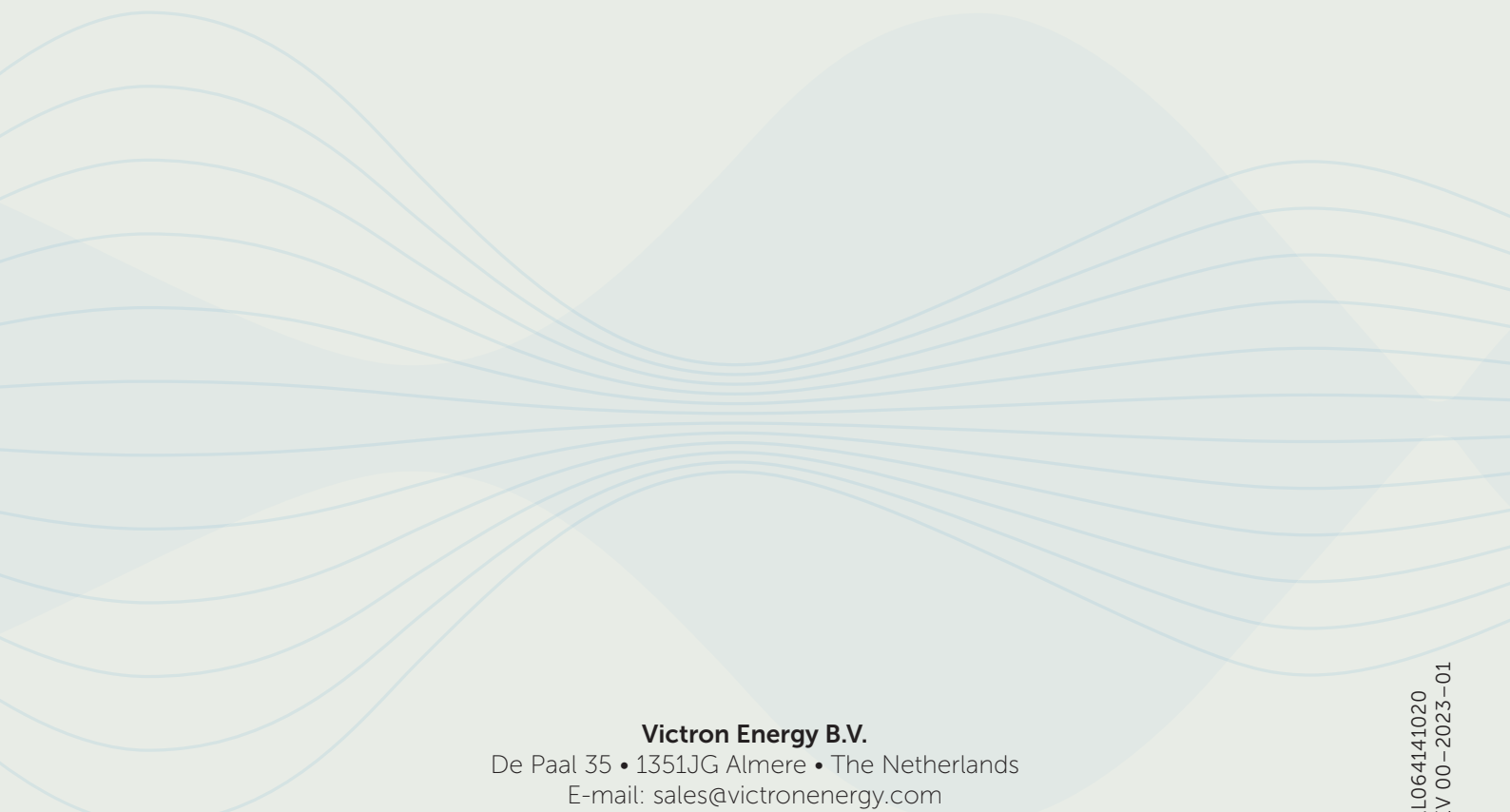
Our worldwide network of authorized dealers is by your side.

Our global network of ±1000 highly trained distributors, installers and service partners are always on hand to help. From stock advice, installation recommendations, after-care and technical support.

With the Victron Energy team, our partners and lively community you can always be sure the power of know-how is by your side.

With the power of know-
how by your side, you get
Energy. Anytime. Anywhere.





Victron Energy B.V.
De Paal 35 • 1351JG Almere • The Netherlands
E-mail: sales@victronenergy.com
www.victronenergy.com

SAL064141020
REV 00-2023-01

