

GREENROCK

THE SALTWATER ENERGY STORAGE SYSTEM



Partner Brochure
Total Integrated Storage System



GREENROCK



Helmut Mayer
CEO



Dr. Thomas Krausse
CEO

Safe Renewable Energy

We all know fossil fuel energy is limited; but annual global consumption is increasing.

In order to maintain the world's livelihood for our **future generations**, we need to shift from fossil fuels to new and innovative **renewable energy** solutions.

Sustainability is the challenge that we strive for. Our goal is independence from fossil fuel. This includes creating a **clean and safe** solution for storing renewable energy. This is our aim, which we devote ourselves with all our passion, determination and commitment.

To meet this demand, we have developed GREENROCK saltwater energy storage, with its reliability as solid as a rock within the dynamic environment of energy storage.

Together with our partners, we offer GREENROCK, the **safest & environmentally-friendly** energy storage in the world.



The complete system



GREENROCK, the **salt water storage system** is available with or without our custom designed, attractive and compact battery housing.

The plug and play system comes with DC power electronics **pre-installed** and the entire system is fully assembled and very simple to connect. Please see pictures later in this brochure.

Interior view: 1-phase complete system with 16 kWh

The Battery



To face the challenges of **increasing energy consumption**, Aquion Energy, a US company, has committed itself to a simple idea: to develop energy storage systems which are high-performance, safe, **sustainable** and cost-efficient.

Aquion developed the world's **most environmentally friendly and safe battery** with their patented Aqueous Hybrid Ion (AHI™) technology. Aquion batteries are closed energy storage systems, based on a unique salt water electrolyte. The batteries are fabricated with abundant, **non-toxic materials** using modern, cost-saving manufacturing techniques.

These saltwater batteries are completely **maintenance-free** and optimized for daily deep discharge. Frequent charging and discharging cycles have no effect on the battery life.

Construction of the Saltwater Battery

This unique technology provides sustainability for the environment & maximum safety in your home.



The inverter



Victron manufactures powerful inverters with pure sine wave, an **advanced battery charger** that uses adaptive charging technology and a **high-speed AC transmitter switch** in a single compact housing. The inverter ensures an **uninterrupted operation**. In the event of a grid failure or an interruption of the generator current, the inverter takes over the supply of the connected loads. Switching takes place in less than 20 milliseconds.

Island ability, unique PowerAssist function

The Victron inverter prevents overloading of a limited AC source. First, the charging process of the battery is automatically reduced to protect against overload. Next, the power of a generator is amplified with energy from the battery.

Multifunctional Capability

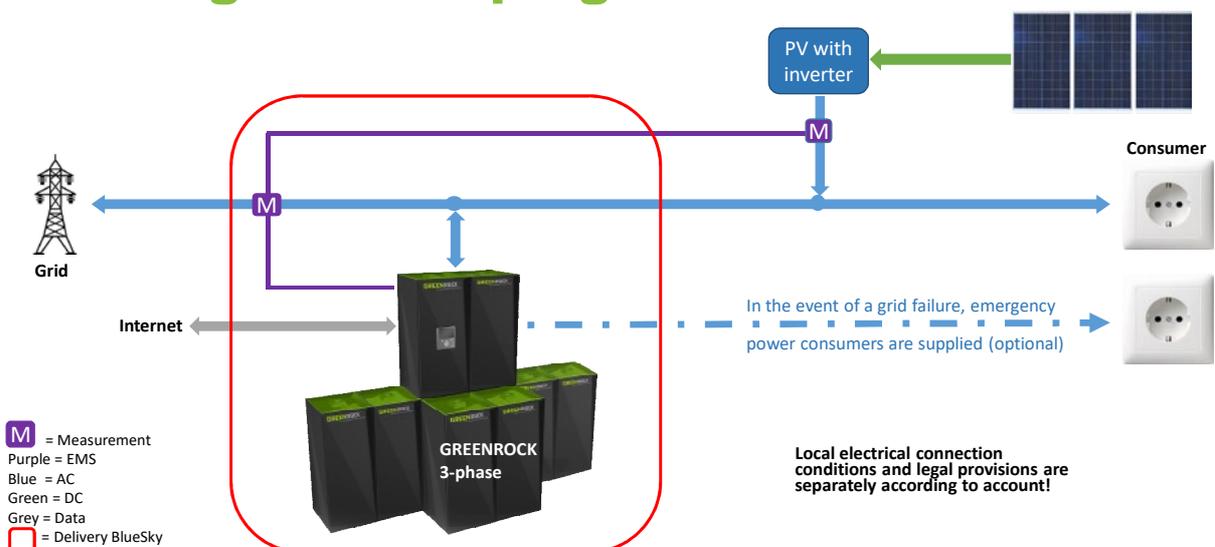
The inverter can be used both for off-grid-connected and grid-connected PV systems as well as for other alternative energy systems.

The charge controller



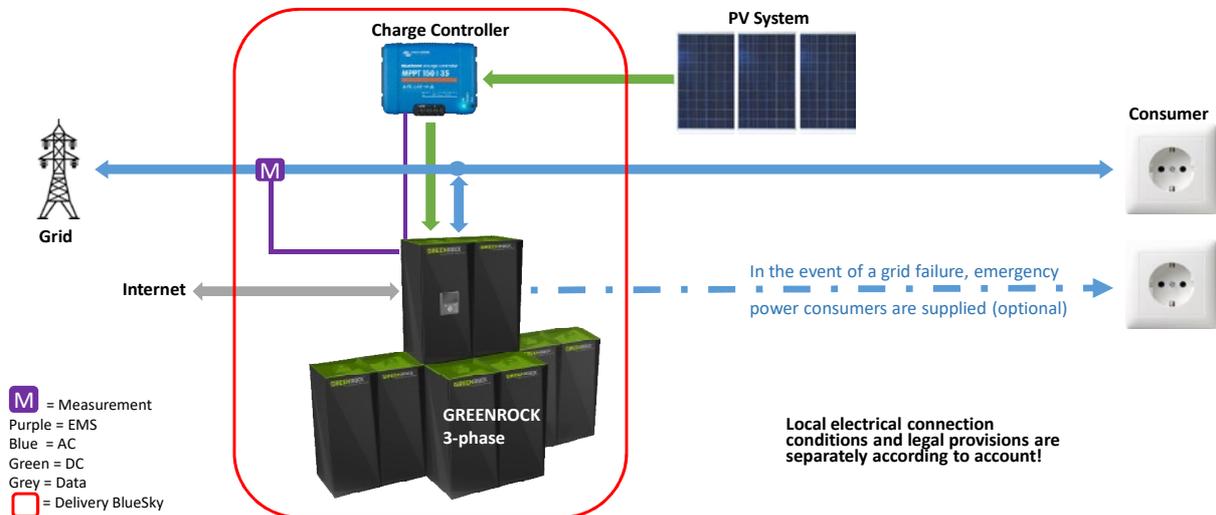
The Ultra-Fast Maximum Power Point Tracking (MPPT). In particular, on cloudy days when the light intensity changes constantly, an extremely fast MPPT controller improves the energy output compared to PWM charge controllers by up to 30% and compared to long-effective MPPT controllers by up to 10%.

System Diagram AC coupling



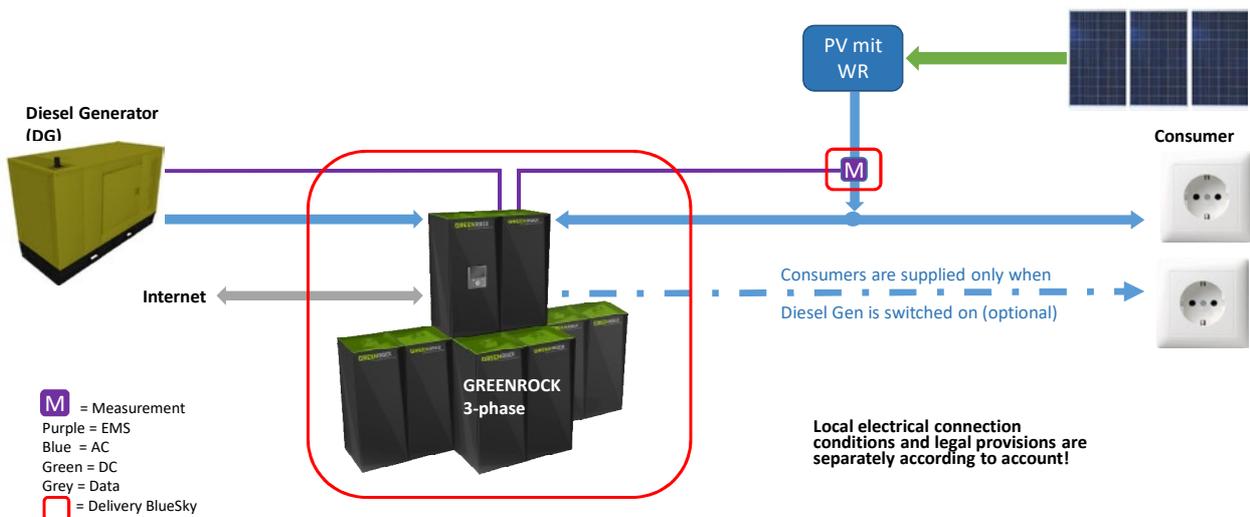
Schematic representation of a 3-phase (1 phase similar) battery system with AC-coupled PV plant. The system is perfectly suited for self-consumption of a new or existing PV system. In accordance with the AC installation certain consumers can be supplied even when a power failure from the memory.

System Diagram DC coupling of PV systems with charge controller



Schematic representation of a 3-phase (1 phase similar) battery system with DC-connected PV system. The System is perfectly suited for self-consumption of a new or existing PV system. Some AC installation can be supplied from the battery even when there's a power failure.

System diagram island solution with AC coupling



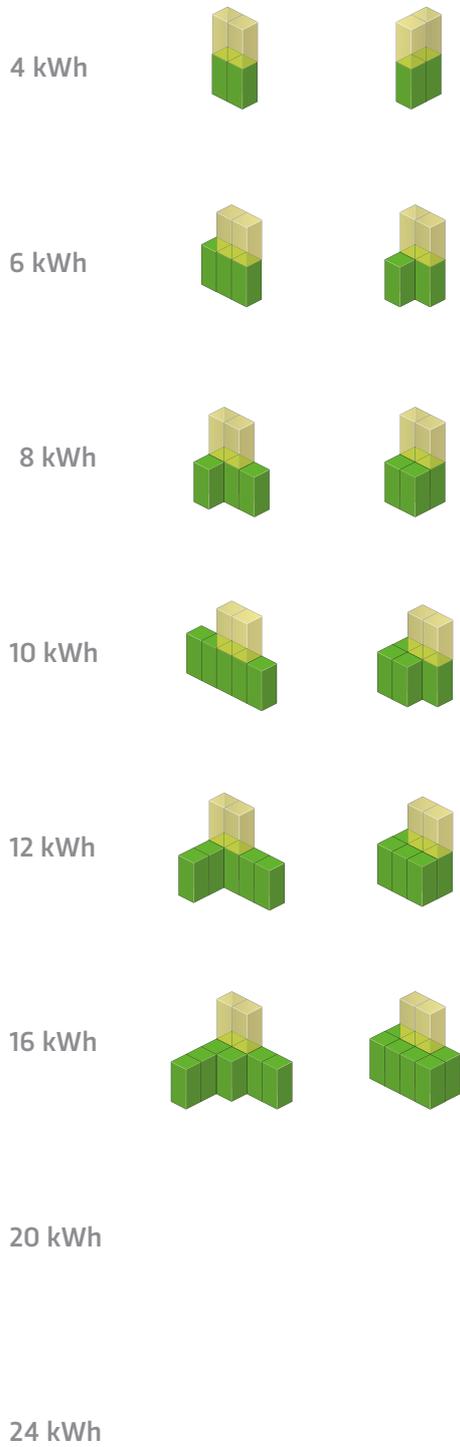
Schematic representation of a 3-phase (1 phase similar) battery system as a stand-alone solution with AC-coupled PV. Switching to stand-alone solution for power failure occurs automatically within <20ms.

Examples for set-up of GREENROCK

1-phase and 3-phase

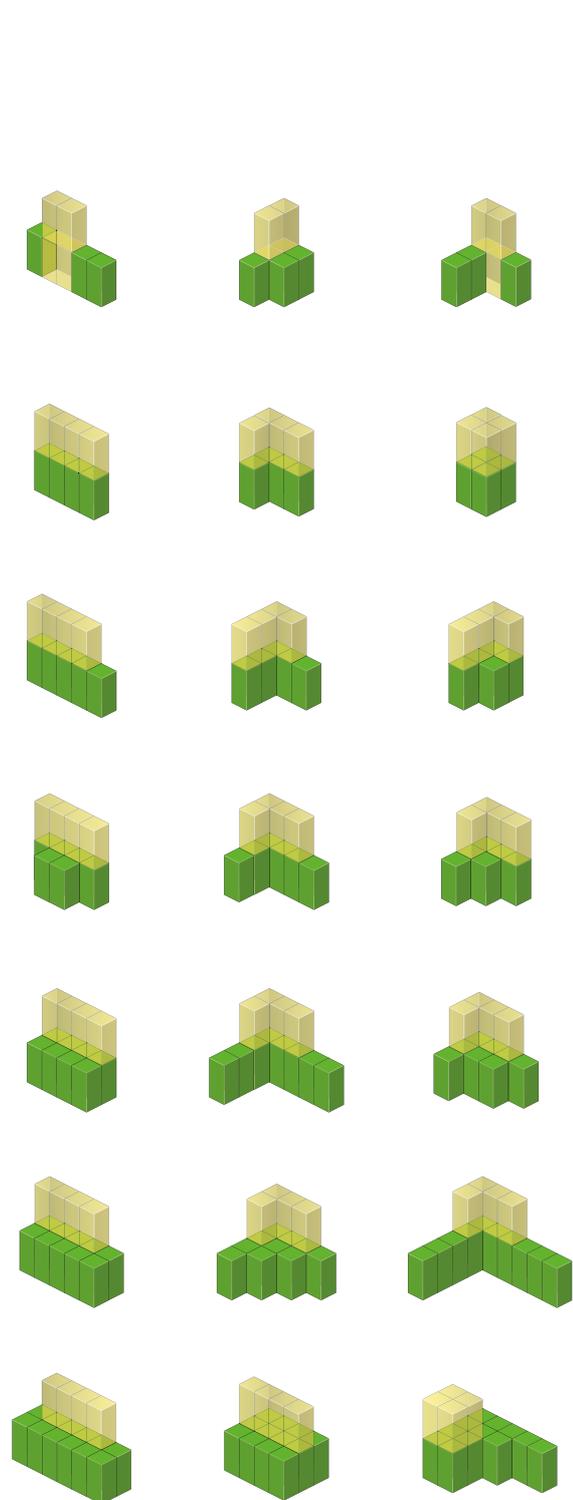
1-phase

One pc. installation box (one inverter)



3-phase

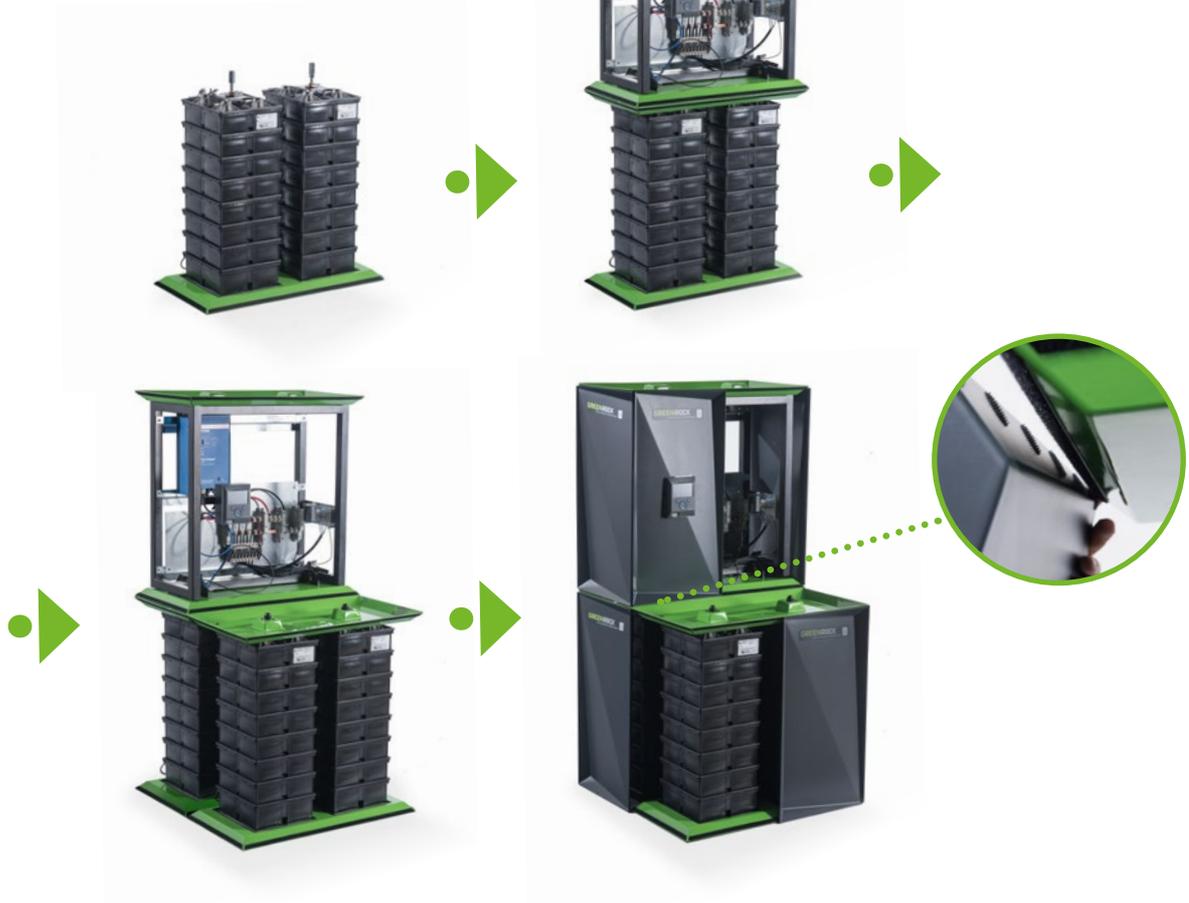
Two pcs. installation boxes (3 inverters)



 2 kWh battery stack; 450 x 450 x 900 mm

 DC installation box; 450 x 900 x 900 mm

Assembly is so easy



M-Block & Container Solution

For medium to large power storage systems, the **M-Block** is ideally suited as a stand-alone solution or combined with other M-Blocks within a **shipping container**. The same, safe and environmentally friendly salt water technology as the smaller systems is used.



An M-block consists of twelve 48 V batteries, delivers >20 kWh of energy and can be scaled up to **several MWh**. BlueSky Energy also offers complete solutions, including power electronics, **ready for connection**.

Technical specifications

System Single Phase

Battery	Aquion S 24V	Aquion S 24V	Aquion S 48V	Aquion S 48V	Aquion S 48V	Aquion S 48V
Oder number	9011 0001 01	9011 0002 01	9011 0003 01	9011 0004 01	9011 0005 01	9011 0006 01
Inverter	Victron		Victron			
EMS	Victron		Victron			
DC distribution	Battery and inverter fuses					
Capacity	4kWh	6kWh	8kWh	10kWh	12kWh	16kWh
Nominal power	1kW	1,3kW	2,0kW	2,4kW	2,4kW	4kW
Max. Efficiency battery	90%	90%	90%	90%	90%	90%
Efficiency inverter	94%	94%	94%	95%	95%	95%
Cycles*	>3000		>3000			
Temperature range	-5°C to +40°C		-5°C to +40°C			
Depth of discharge (DOD)	100%		100%			
Communication	Modbus-TCP		Modbus-TCP			
Dimensions battery case	W x H x L in mm			W x H x L in mm		
	2x 450x900x450	3x 450x900x450	4x 450x900x450	5x 450x900x450	6x 450x900x450	8x 450x900x450
Dimensions junction box	W x H x L in mm			W x H x L in mm		
	900x900x450	900x900x450	900x900x450	900x900x450	900x900x450	900x900x450
Weight batteries	2x 118kg	3x 118kg	4x 118kg	5x 118kg	6x 118kg	8x 118kg
Weight junction box**	approx 20kg	approx 20kg	approx 20kg	approx 20kg	approx 20kg	approx 20kg
Exhibition indoor/outdoor	indoor		indoor			

*70% useable capacity (can still be operated easily and safely) >15 years of life

**exact weight specifications will follow

System Three Phase

Battery	Aquion S 24V	Aquion S 24V	Aquion S 24V	Aquion S 24V	Aquion S 24V	Aquion S 24V	Aquion S 48V
Oder number	9011 3001 01	9011 3002 01	9011 3003 01	9011 3004 01	9015 3005 01	9016 3006 01	9011 3007 01
Inverter	Victron						Victron
EMS	Victron						Victron
DC distribution	Battery and inverter fuses						
Capacity	6kWh	8kWh	10kWh	12kWh	16kWh	20kWh	24kWh
Nominal power	1,5kW	2,0kW	2,1kW	3,0kW	3,9kW	3,9kW	6kW
Max. Efficiency battery	90%	90%	90%	90%	90%	90%	90%
Efficiency inverter	94%	94%	94%	95%	95%	95%	95%
Cycles*	>3000						>3000
Temperature range	-5°C to +40°C						-5°C to +40°C
Depth of discharge (DOD)	100%						100%
Communication	Modbus-TCP						Modbus-TCP
Dimensions battery case	W x H x L in mm						W x H x L in mm
	3x 450x900x450	4x 450x900x450	5x 450x900x450	6x 450x900x450	8x 450x900x450	10x 450x900x450	12x 450x900x450
Dimensions junction box	W x H x L in mm						W x H x L in mm
	2x 900x900x450	2x 900x900x450	2x 900x900x450	2x 900x900x450	2x 900x900x450	2x 900x900x450	2x 900x900x450
Weight batteries	3x 118kg	4x 118kg	5x 118kg	6x 118kg	8x 118kg	10x 118kg	12x 118kg
Weight junction box**	approx 45kg	approx 45kg	approx 45kg	approx 45kg	approx 50kg	approx 50kg	approx 70kg
Exhibition indoor/outdoor	indoor						indoor

*70% useable capacity (can still be operated easily and safely) >15 years of life

**exact weight specifications will follow

DC-coupling from PV systems with charge controller

No. of charge controllers	1	1	2	2	1	2	2
Voltage	24 V	24 V	24 V	24 V	48V	48V	48V
Order number	9011 4001 01	9011 4002 01	9011 4003 01	9011 4004 01	9011 4005 01	9011 4006 01	9011 4007 01
Charge controller	Victron						
Power	2,4kWp	2,9kWp	4kWp	4,8kWp	5,8kWp	8kWp	11,6kWp
Information per charge controller							
Max. PV open circuit voltage	145V						
Max. short circuit current	70A	70A	50A	70A	70A	50A	70A
Max. PV power	2400Wp	2900Wp	2000Wp	2400Wp	5800Wp	4000Wp	5800Wp
Max. efficiency	98%						
PV connector	3x MC4 plug	3x MC4 plug	2x MC4 plug	3x MC4 plug	3x MC4 plug	2x MC4 plug	3x MC4 plug
Dimensions	W x H x L in mm						
	246x295x103	246x295x103	215x250x95	246x295x103	246x295x103	215x250x95	246x295x103
Weight	4,5kg	4,5kg	3kg	4,5kg	4,5kg	3kg	4,5kg
Exhibition indoor/outdoor	indoor, wall mounting						

cradleto cradle™ certificate



The salt water batteries of Aquion are the only **energy storage awarded** the cradleto cradle™ certification. The cradleto cradle™ certificate from a **independent** Institute issued in the US, for Pro-products which meet the strict guidelines in terms of safety and sustainability.



References

Also this farmer in Upper-Austria is utilizing a 72 kWh GREENROCK system



24 kWh system in a house with 8 apartments in Styria, Austria



18 kWh battery in Emsland, Germany

GREENROCK

THE SALTWATER ENERGY STORAGE SYSTEM



Fornacher Strasse 12 . 4870 Vöcklamarkt . Austria
+43 720 01 01 88 99 . greenrock@bluesky-energy.eu
bluesky-energy.eu/greenrock