



Today - “We all drive differently”

Victron Energy B.V.

NCS BRE Energy Storage Guide. Consumer & Technical.

Products

ESS Overview

Hub 1, 2, 4 & 5.

Configuring a System

Calculating solar systems

Free to use Web Portal

Battery Sizing

NSC BRE

bre

www.bre.co.uk

Batteries and Solar Power: Guidance for domestic and small commercial consumers



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BRE
NATIONAL
SOLAR
CENTRE

RECC ✓
RENEWABLE ENERGY CONSUMER CODE

Victron Company Profile

 victron energy
SINCE 1982

Dedicated solutions
Multiple Markets means a Sustainable Future
A Family Owned 40 year old Quality Supplier.

Marine



ES & Off Grid



Automotive



Industrial



Mobility



Telecom

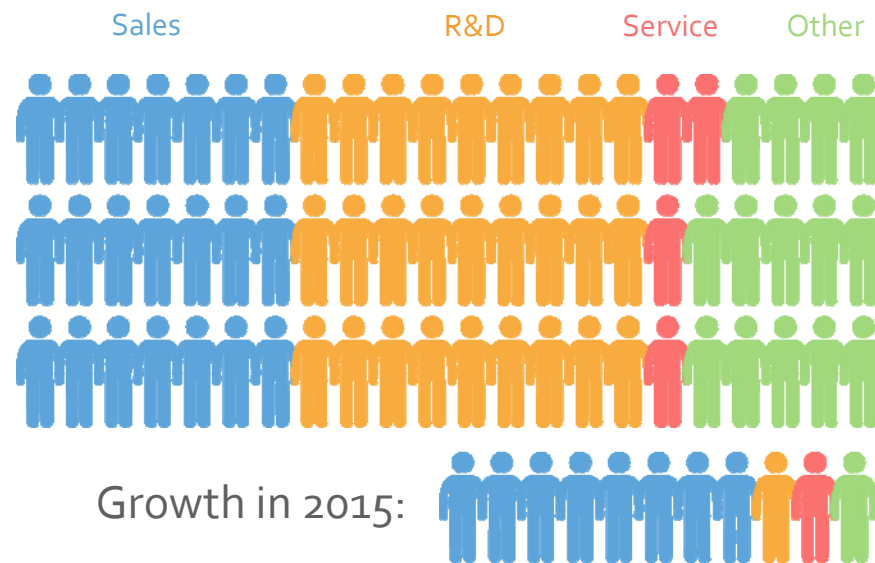


Energy. Anytime. Anywhere.

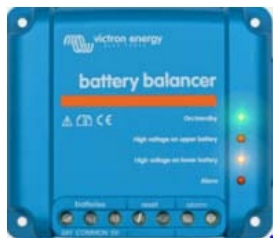
Victron today – 49% growth in 2015



Team of 77 experts:



Victron – Product Range



Inverter/Chargers. All-in-one. Pb & Li Batteries
Chargers, Battery Protectors & Balancers,
Control Screens and Monitors.
LAN & Web based Comms. 800+ products



Victron Range - Inverter / Chargers



Victron have the most extensive range that will suit your customer.

Invitation to join our training days

Learn how to install one type, you can install all of them.

Base Load - 800, 1200, 1600, 2000, 3000, 5000, 8000 & 10,000VA Max Load.

EcoMulti (all-in-One)

All of them can be easily set-up to match the end users energy profile

Remote monitoring and configuration via our free to use web portal.

Victron Products



12v AGM, GEL, 2v OPZS, OPZV

LiFePO₄ Modular batteries, 60Ah, 90Ah, 160Ah and 200Ah (300Ah future plan)

Pb & Li Chemistries inc LG, Hoppecke, ZBM, Aquion.

Compatible with 12v 24v & 48v batteries

Battery Balancers

MPPT's charge controllers.

Li & Pb Chargers

Self consumption

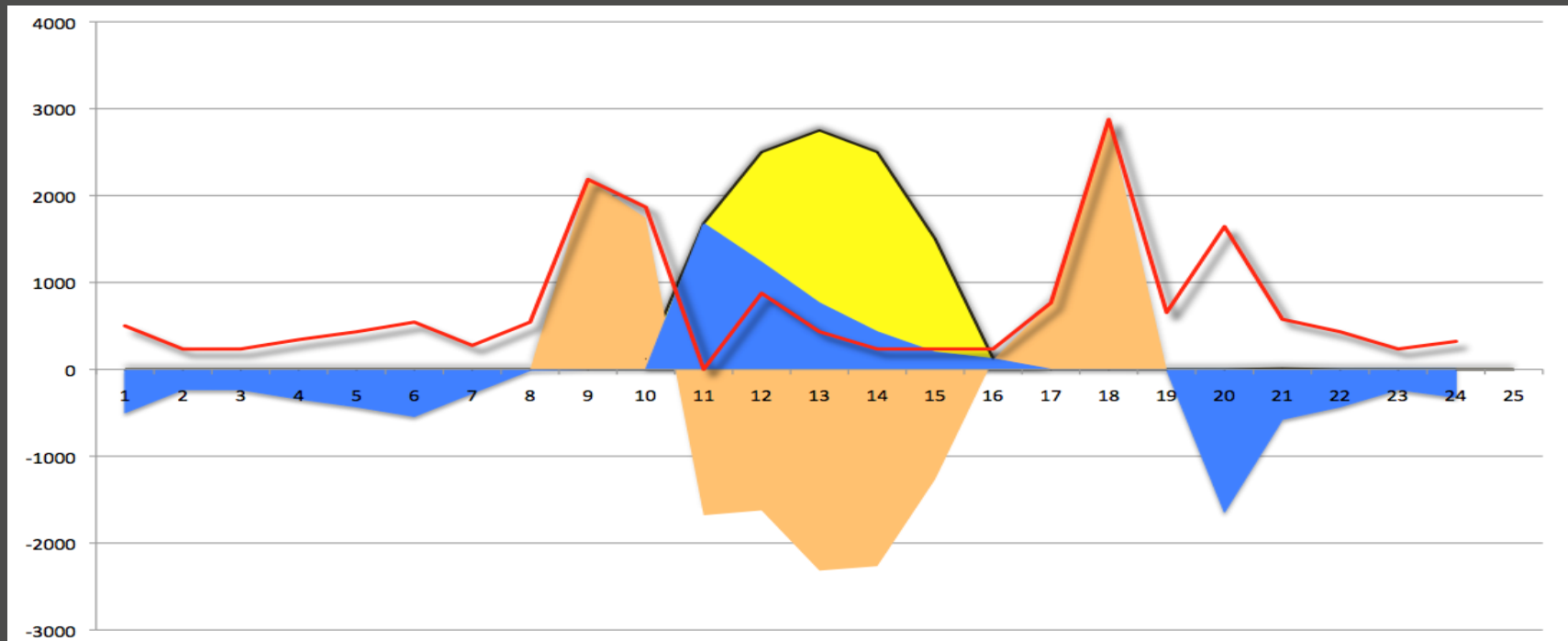


Means that energy used, is self generated and used directly or later when stored in batteries. Even sold back to the Grid
It is also possible to buy energy at low tariff rates, store and use when required.

KPMG

“Our analysis shows that these may soon be economic for both domestic and business prosumers in certain circumstances, allied with an appetite for early deployment due to nonfinancial buying criteria³. For example, we expect that it may become economic for households with existing generation assets to ‘retrofit’ storage from around 2017.”

Home storage



HUB systems – A Family of ESS

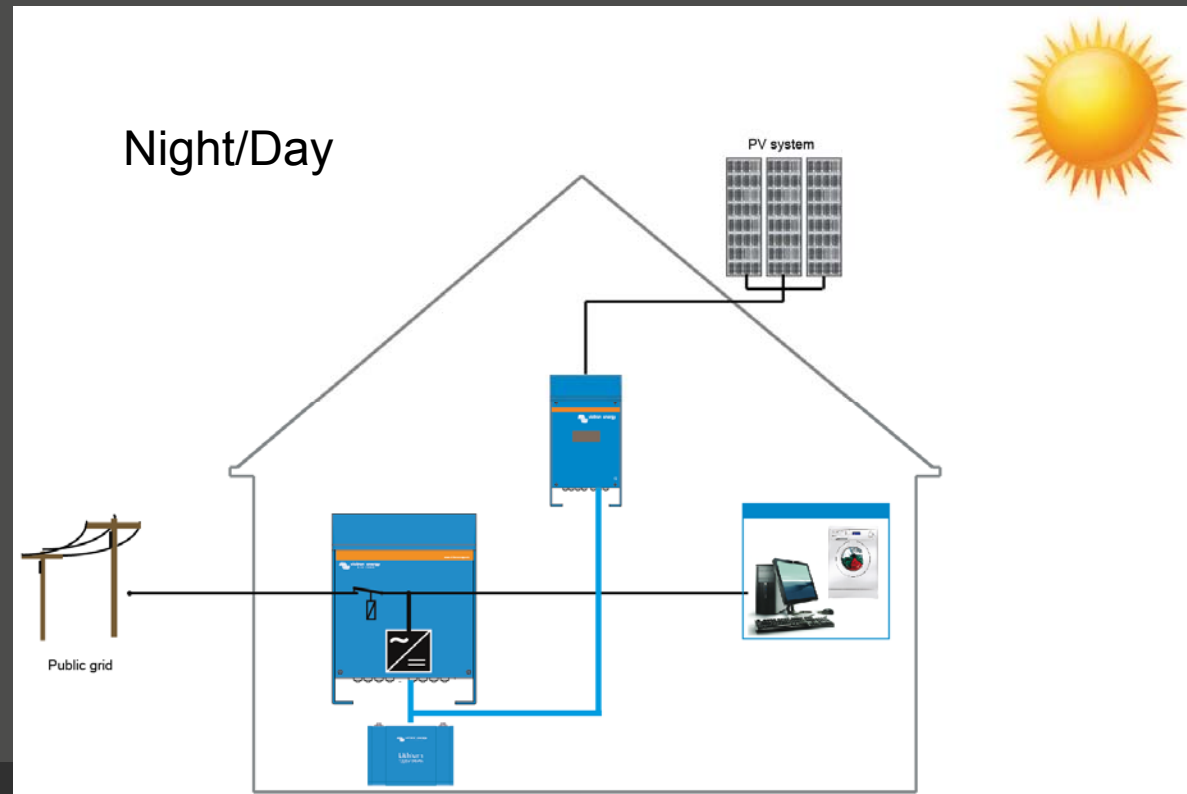


Victron have various options on how to store surplus energy.

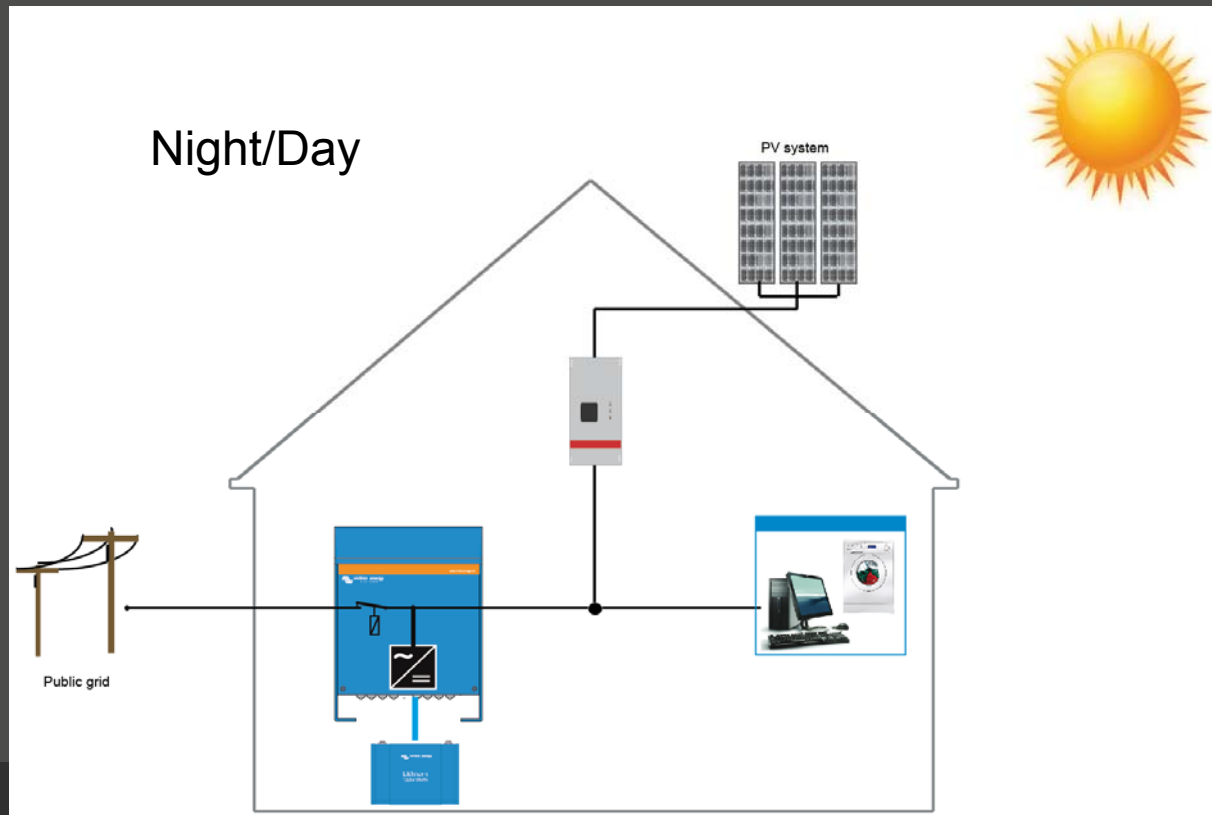
Grid inverters (AC), Some with charge controllers (DC).

The principle of how to handle surplus energy at Victron Energy is called a HUB system

Victron Energy Storage Hub 1



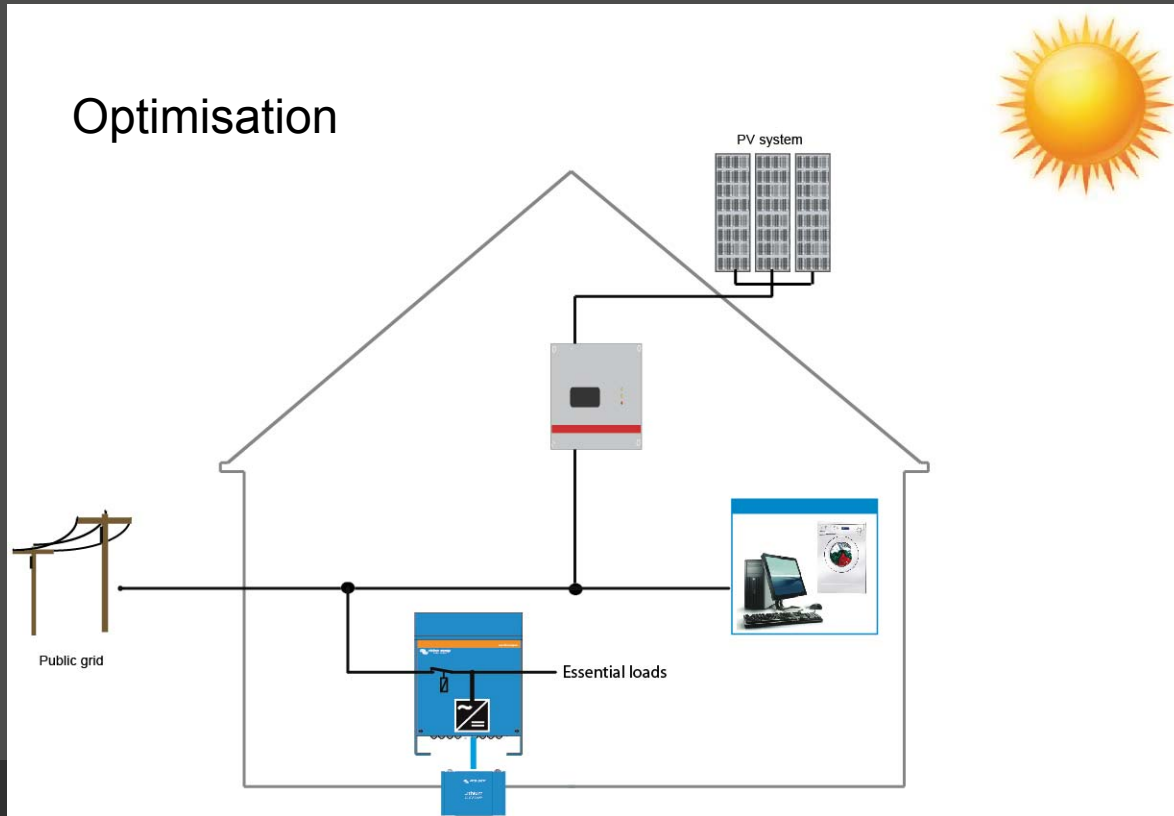
Victron Energy Storage Hub 2



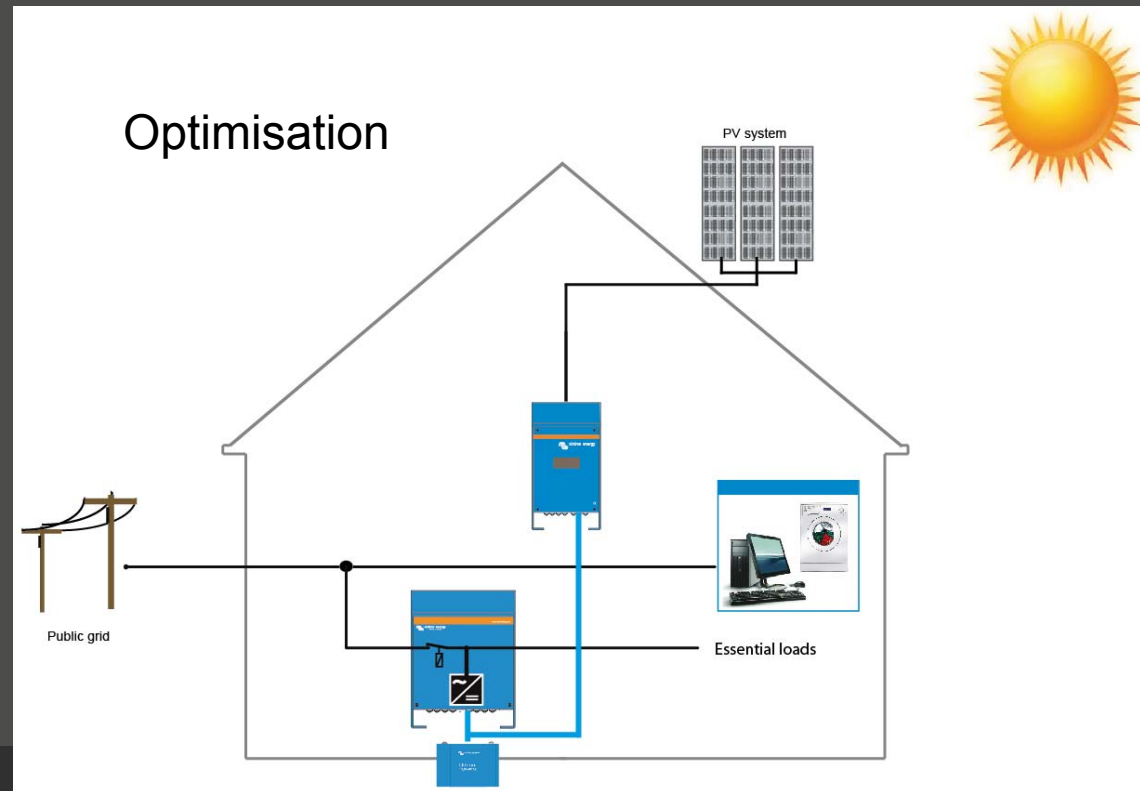
Victron Energy Storage Hub 4



Optimisation



Victron Energy Storage Hub 5



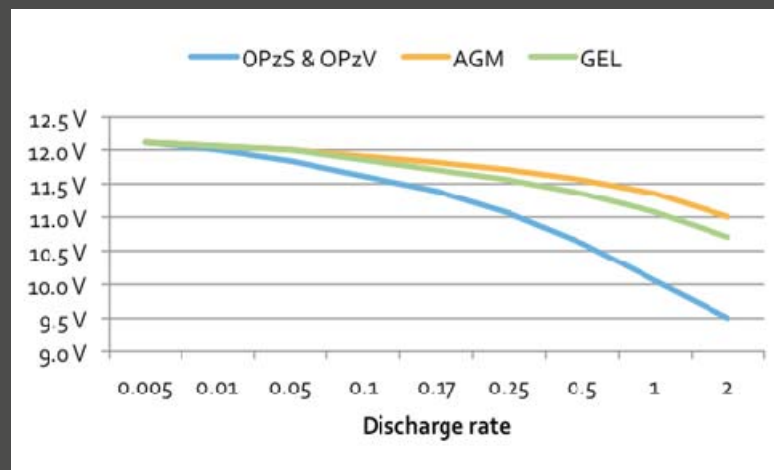
Hub-4 / grid-parallel – Inverter matches user, not PV size

- Optimize self-consumption, charges when there is surplus PV, discharges when there is a load.
- AC-Coupled PV – very easy retrofit.
- No Max installed PV power. Any size Battery Inverter Multi/Quattro size
- Two AC load types
 1. Standard
 2. UPS Output
- Surplus AC Coupled PV-power can be exported to the grid G83/59 Cert.
- Auto Winter Mode

Hub-4 / grid-parallel



- Single phase application: use L2 to measure PV Inverter output (for free)
- Configure the customers system from anywhere via our free portal
- Dynamic Cut-Off.



Hub-4: Phase compensation for 3 phase systems

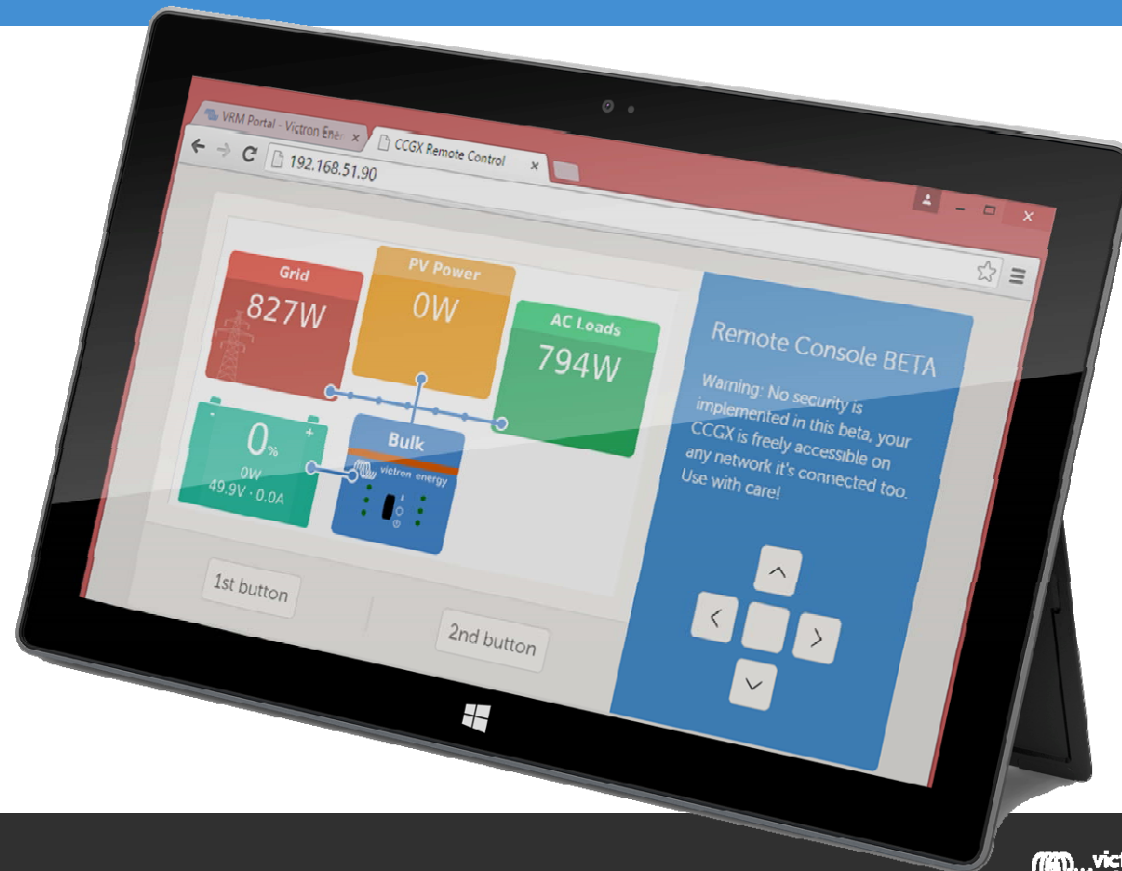


	L1	L2	L3	Total
Load	100 W	400 W	200 W	700 W
Inverter/charger	-700 W	0 W	0 W	-700 W
Distribution box	-600 W	400 W	200 W	0 W

Internet Connectivity - VRM Online Portal



Remote Console on LAN



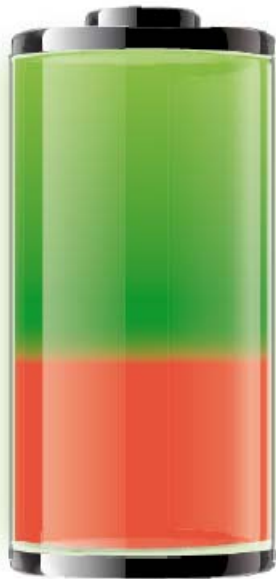
Calculating battery based solar systems & user profile

When to use which battery?



Battery choice – Budget - Usage – Location.

Lead Acid
(GEL/AGM/Flooded)



50-70%

Usable energy

Lithium



80-100%

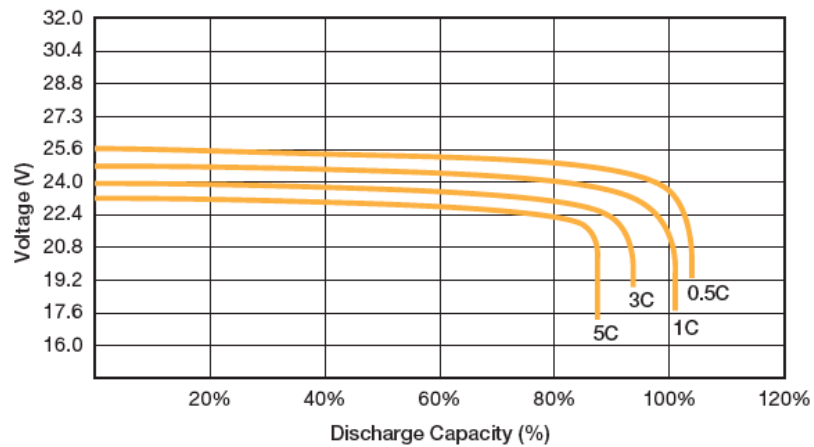
Battery choice – Single Person Installation?



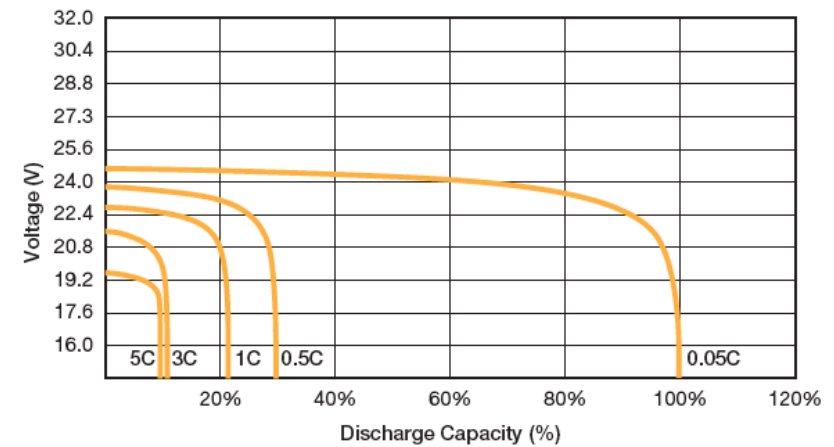
Battery choice – LiFePO₄ out performs Pb.

Usable energy

Lithium

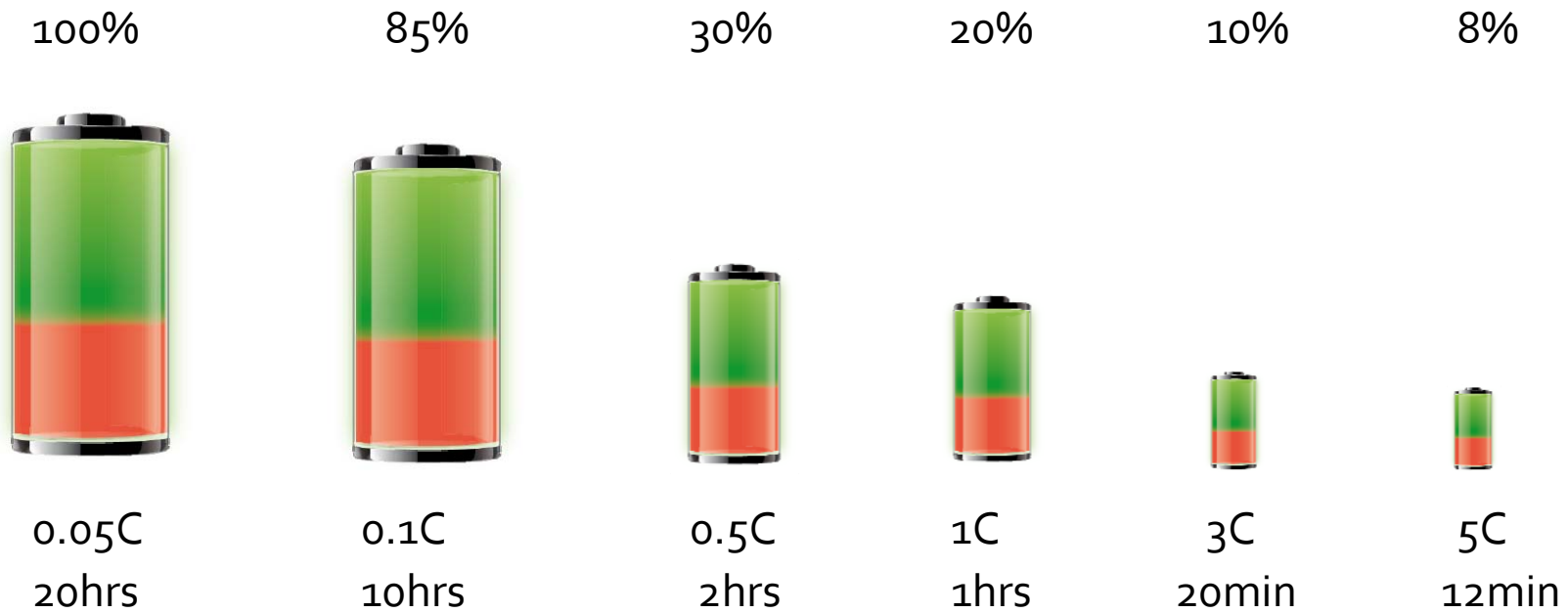


Lead Acid



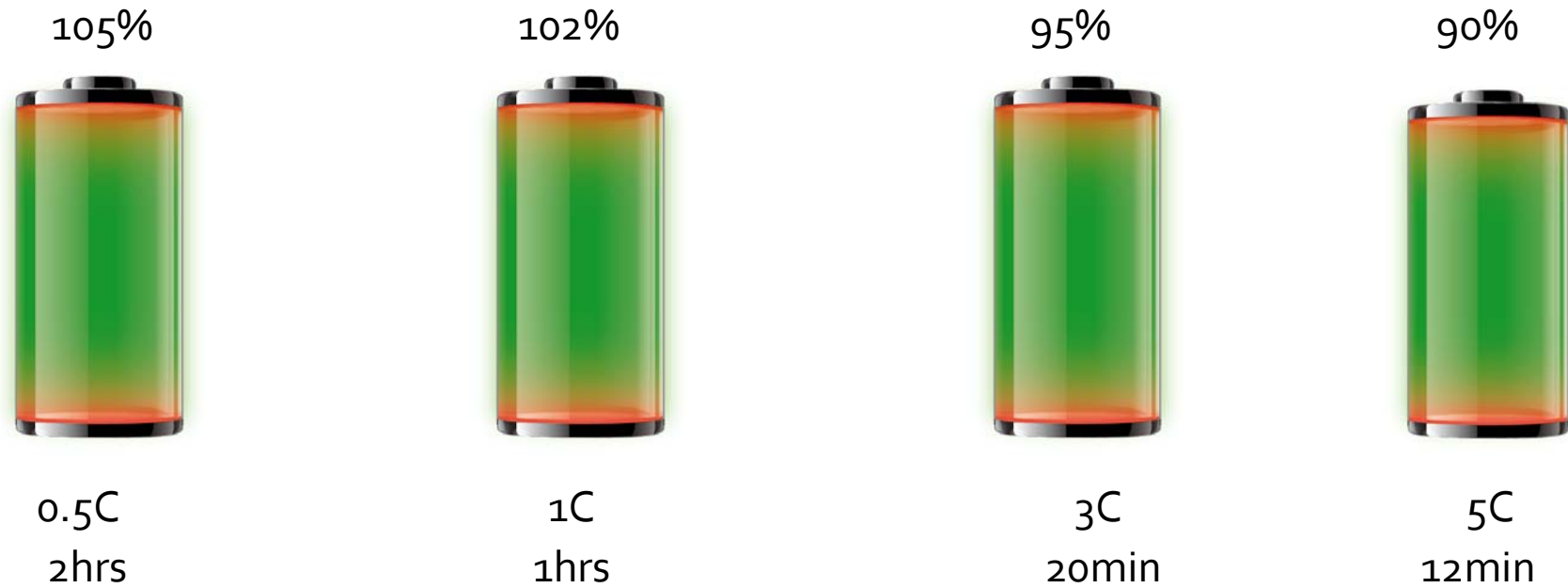
Battery choice

Usable energy (Lead Acid)

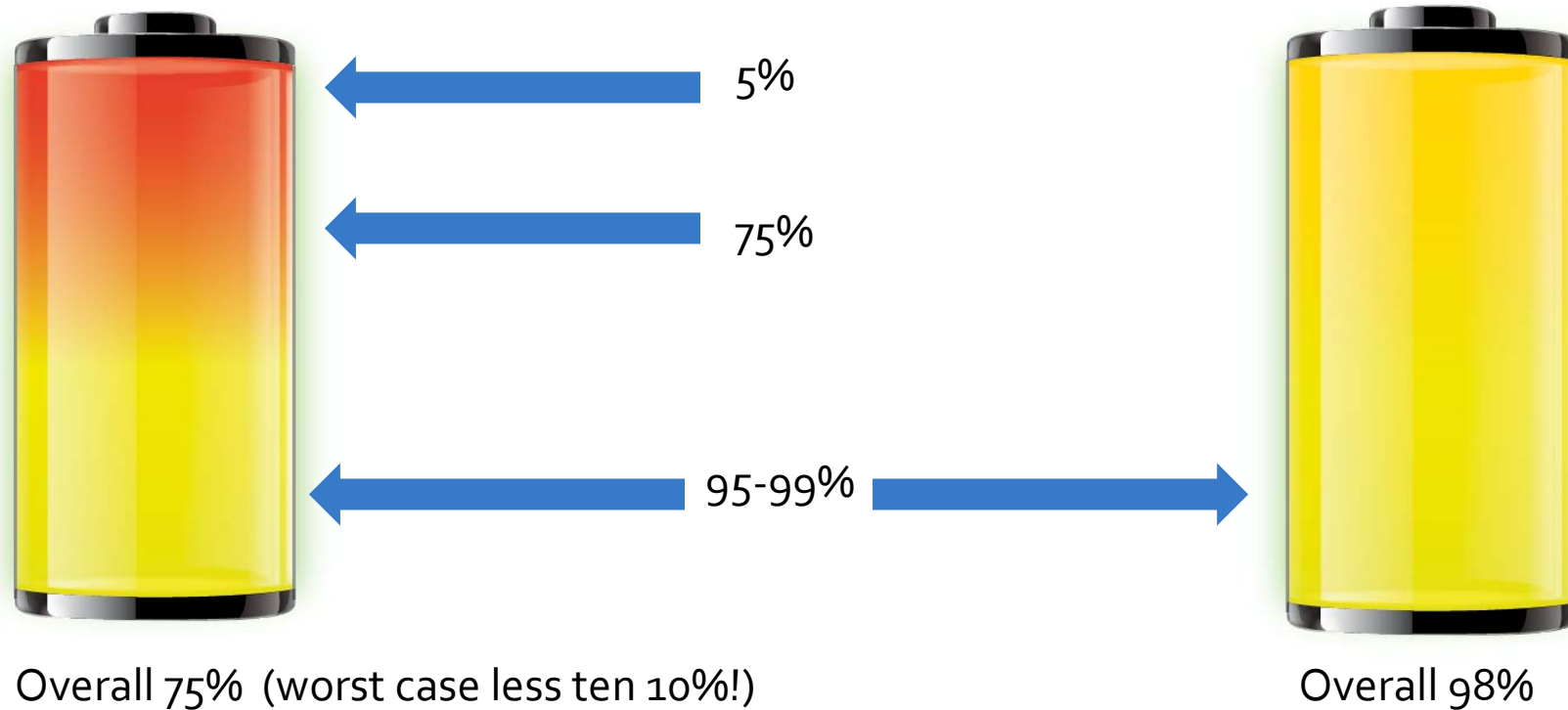


Battery choice

Usable energy (Lithium)



Charge efficiency – Surplus PV is precious.



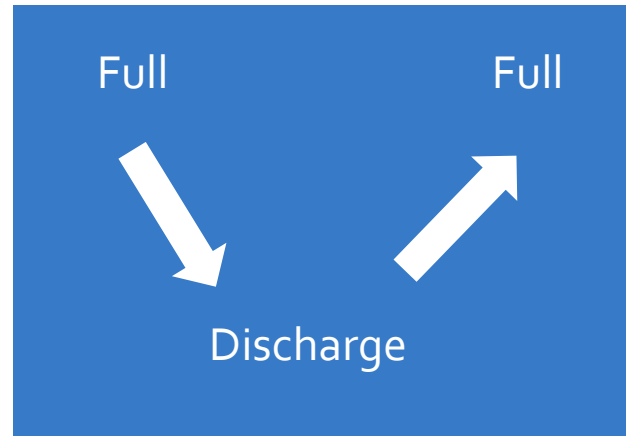
Battery choice

2000-4000

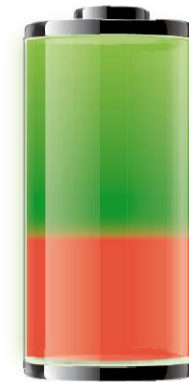


Lithium

Cycle life



400-1500



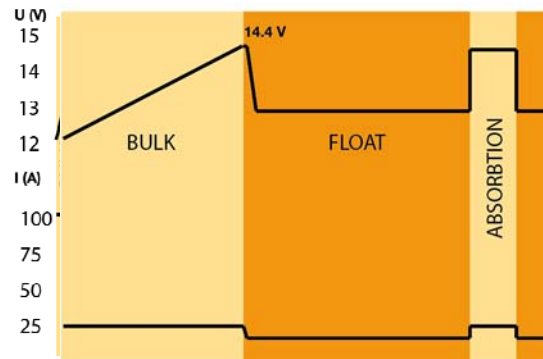
Lead acid

Internal SOC



SOC 90%

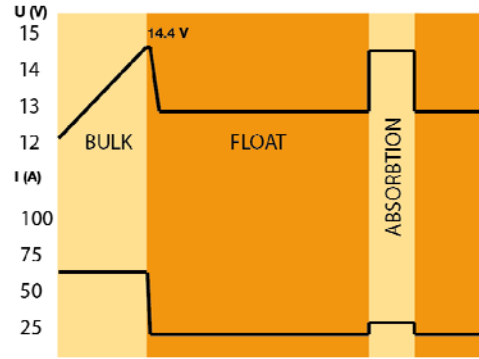
250Ah Lead Acid



25 Amp charging

SOC 70%

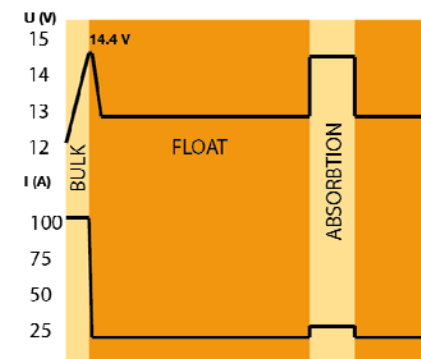
250Ah Lead Acid



60 Amp charging

SOC 60%

250Ah Lead Acid



100 Amp charging

Configuring a system

- ✓ Balance in the components used.
- ✓ Losses during use
- ✓ Lifetime calculations
- ✓ Redundancy

Most problems can be taken to its system design, mid & long term satisfaction will reduce your costs.

Battery capacity

Logic - You may think the battery capacity should equal the surplus PV that can normally be generated per day.

example;

4Kwp solar → 4 hrs

-/+ 16Kwh energy storage

-/+ 32Kwh installed capacity

-/+ 650Ah@48Vdc or 1300Ah @24Vdc. A large battery!

Be realistic - take an average day and consider any Critical Loads to establish a system the customer can afford and explain to your customer what it could provide at what times of the year.

Configuring a system

Load balance principle

<i>Name</i>	<i>Peak</i>	<i>Hours in use</i>	<i>factor</i>	<i>total energy</i>
Washing machine	2,5Kw	2	20%	1 Kwh

$$(2500 \times 2 \times 0,2 = 1 \text{ Kwh})$$

Focus on major loads in the system and take worst case scenario

Configuring a system

Load balance

<i>Name</i>	<i>Peak</i>	<i>Hours in use</i>	<i>factor</i>	<i>total energy</i>
Washing machine	2,5Kw	2	20%	1 Kwh
Lights	280watt	4	100%	1,1 Kwh
Fridge	120watt	24	30%	0,9 Kwh
Pumps	7Kw	1 min	100%	0,16 Kwh
Coffee machine	2Kw	20 min	100%	0,67 Kwh
Total	11,9Kw			3,8Kwh

Inverter always needs to be more powerful than the biggest load !!

Configuring a system

Take also aging of battery in account before specifying battery capacity

Load balance – Peak (Grid) Base Load (Battery)

Total *peak* *11,9Kw* (Minimum 10Kva Inverter)
energy *3,8Kwh* (Battery energy available)

System voltage		48Vdc	Pb 79Ah	Li
Maximum discharge level	50%		158Ah	95Ah
Maximum discharge current Pb	0,5C		375Ah	114Ah
<i>(Bulk only so + 15%Pb, 0%Li, Aging End of Life + 30% Pb, 20% Li)</i>				

So here 48v 18kWh Pb or 51.2v 6kWh LiFePO₄.

Configuring a system

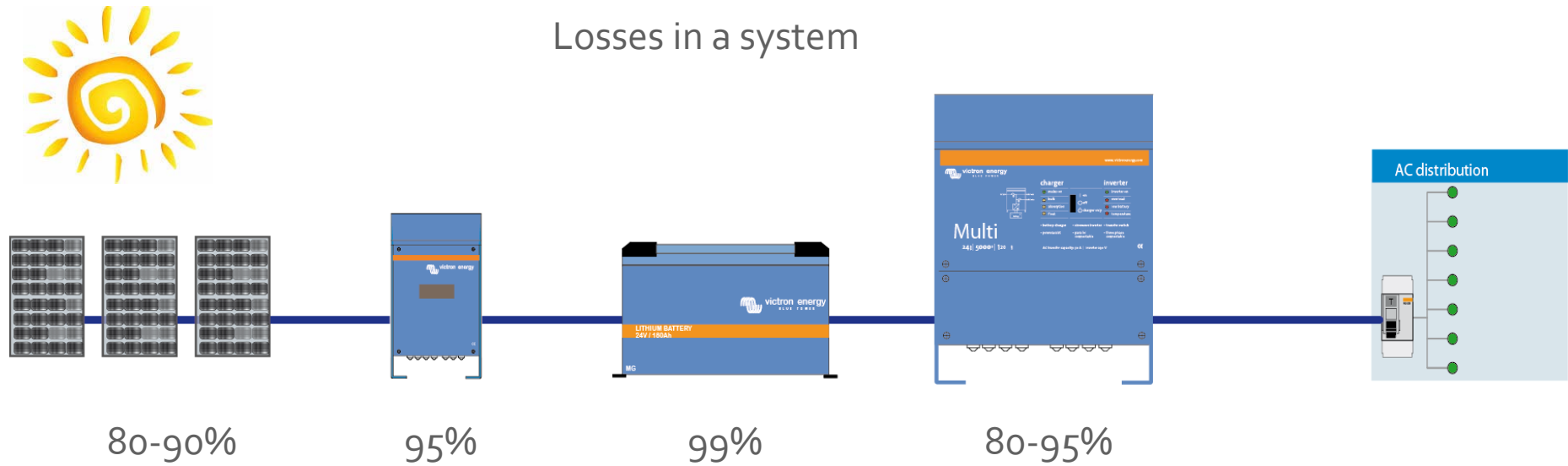
Losses – All Systems Consume Energy

Remarks

- ✓ Standby power of inverters
- ✓ Batteries capacity drop at high discharge
- ✓ Temperature de-rating

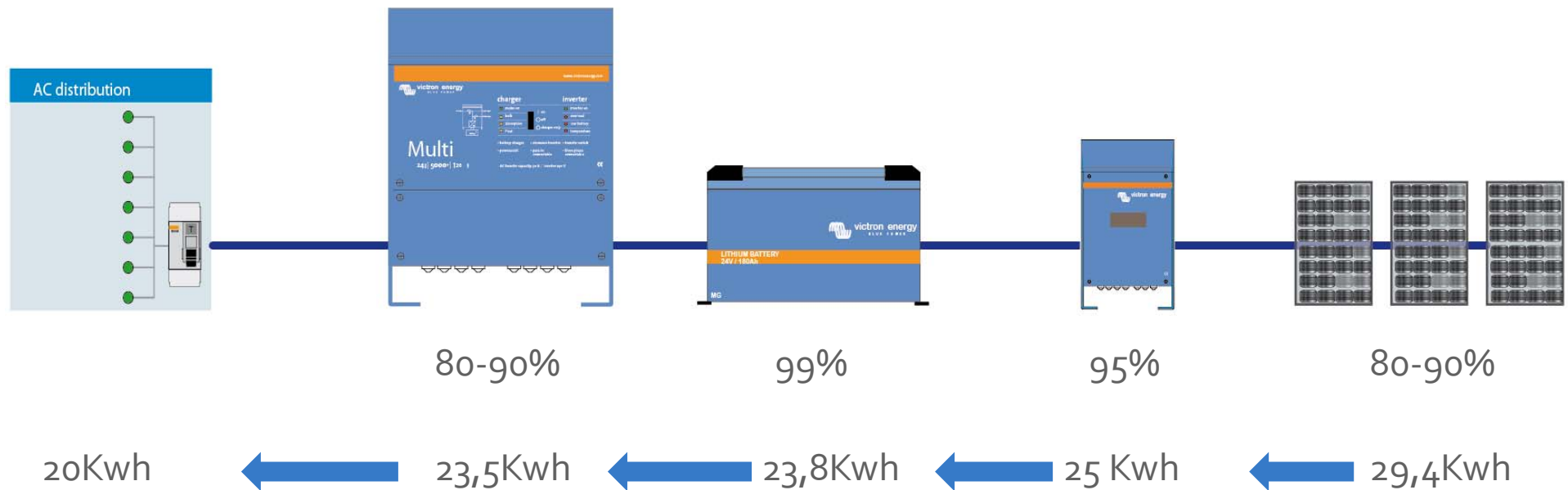
Standby
2K → 10watt
3K → 15watt
5K → 25watt
10K → 35watt

Configuring a system

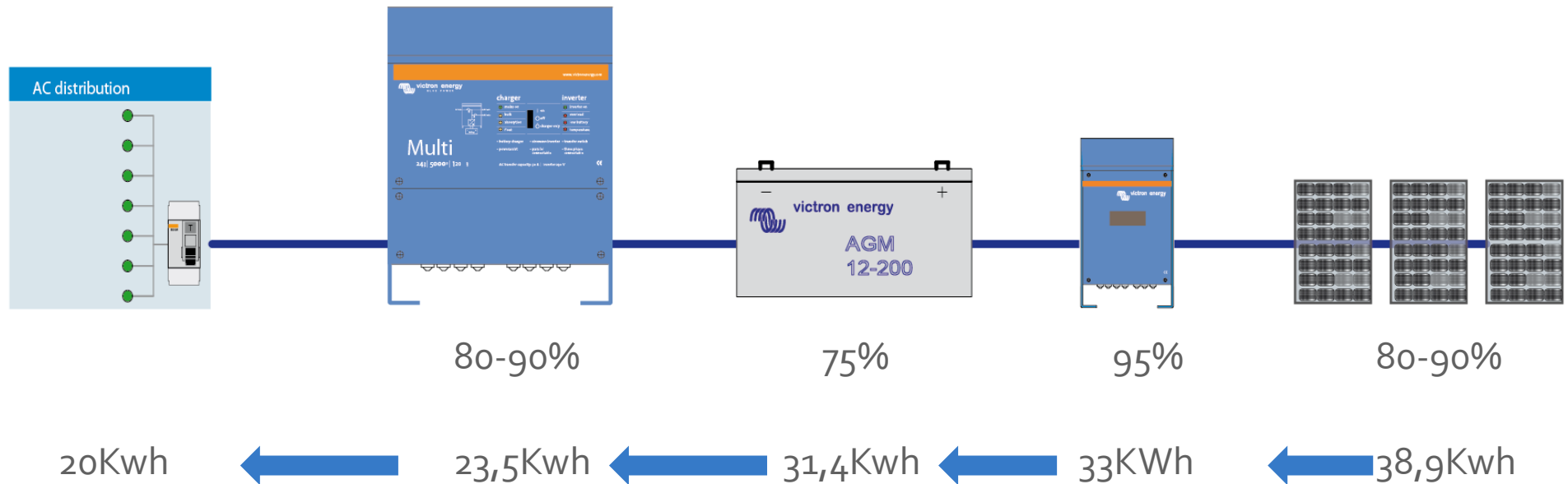


Configuring a system

Losses in a Lithium system



Configuring a system Losses in a Pb system



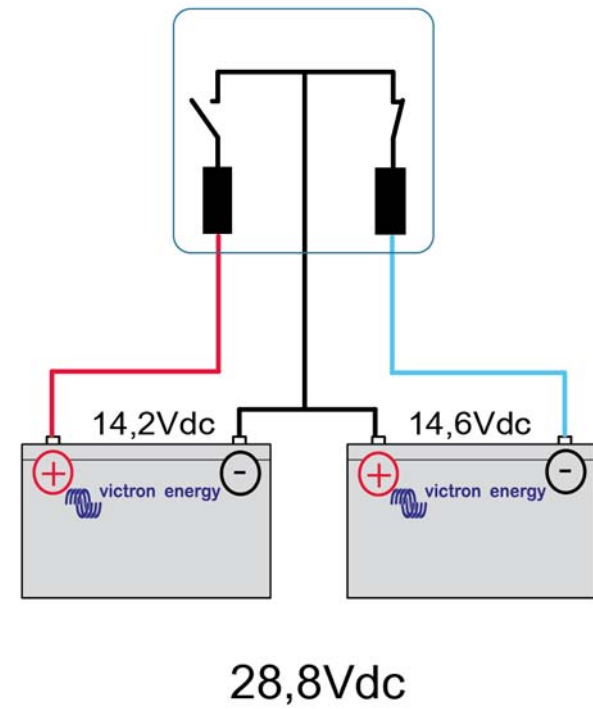
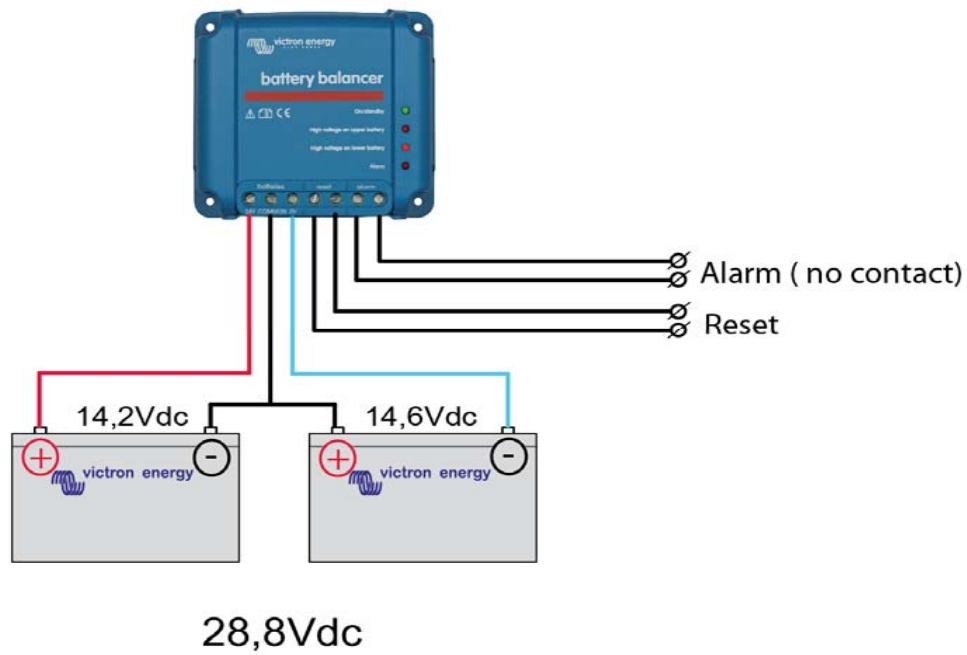
Battery balancer Pb

Not all batteries are created equal.

When multiple batteries are combined into one large battery bank, the small differences between the batteries can cause problems that substantially shorten the life time.



Battery balancer



Victron Energy

Energy. Anywhere. Anytime.

Thank you

