



# Energy Storage Solutions



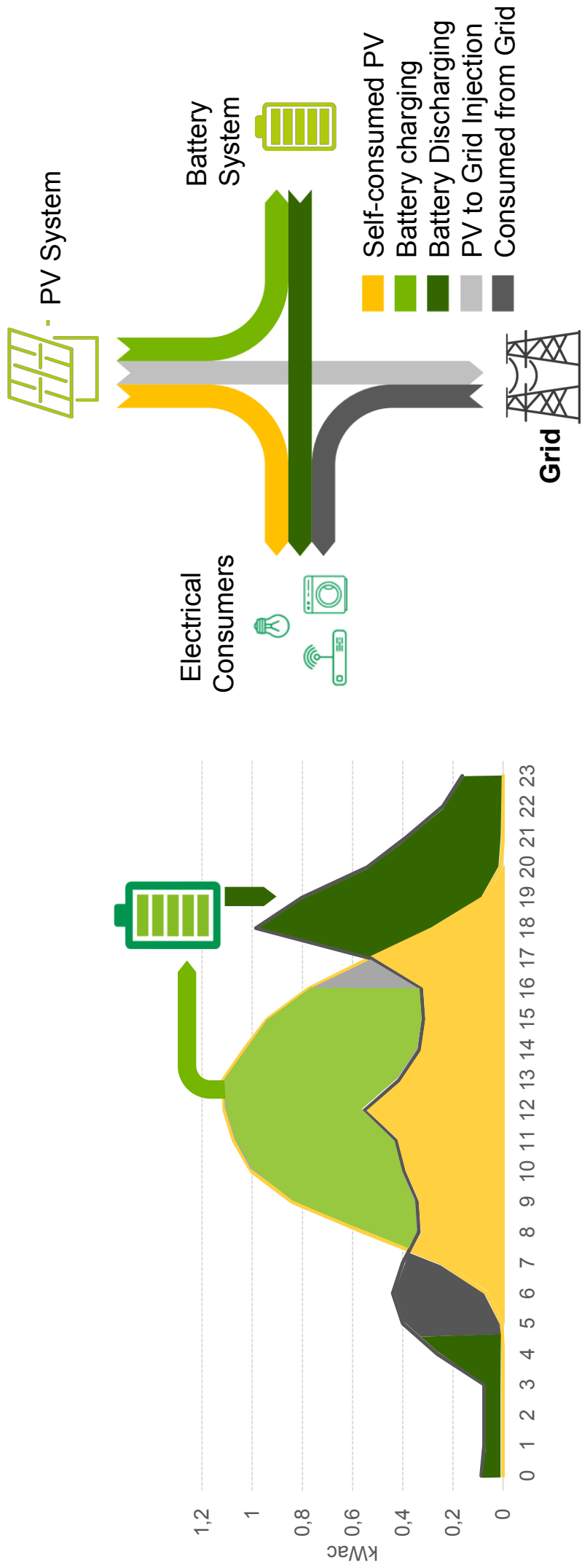
r.e.think energy



# General Information

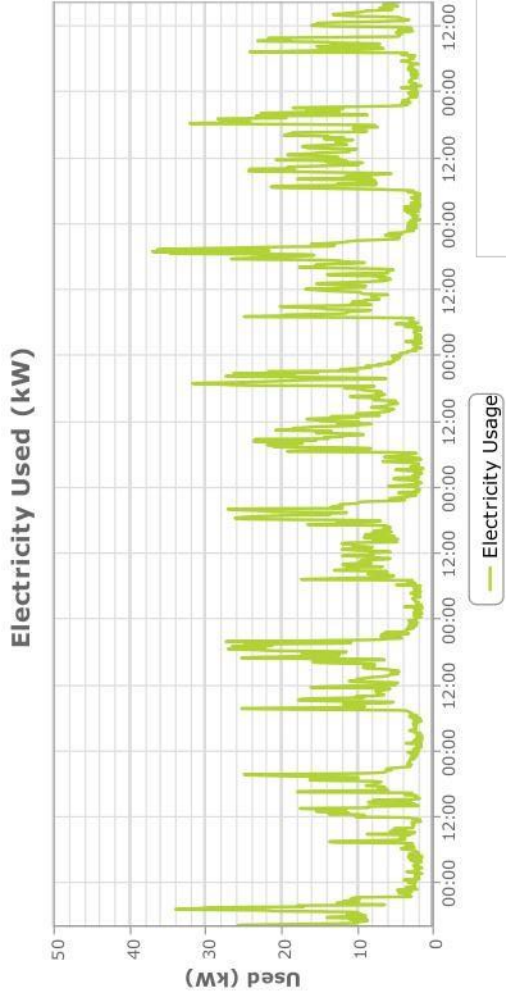


# Different Energy Flows

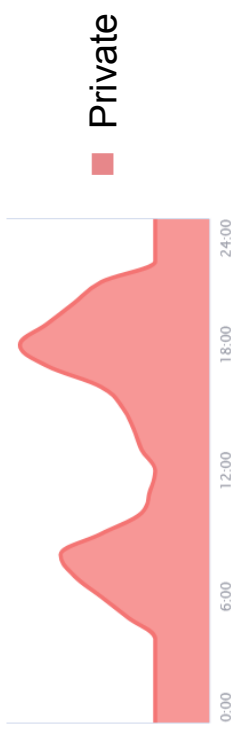




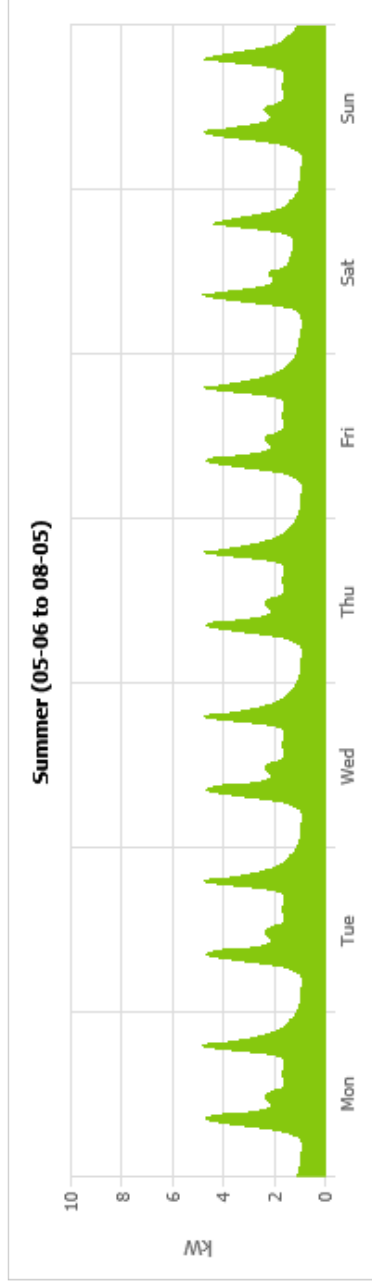
# Different Load Profiles



FAMILY WITH SCHOOL-AGE CHILDREN

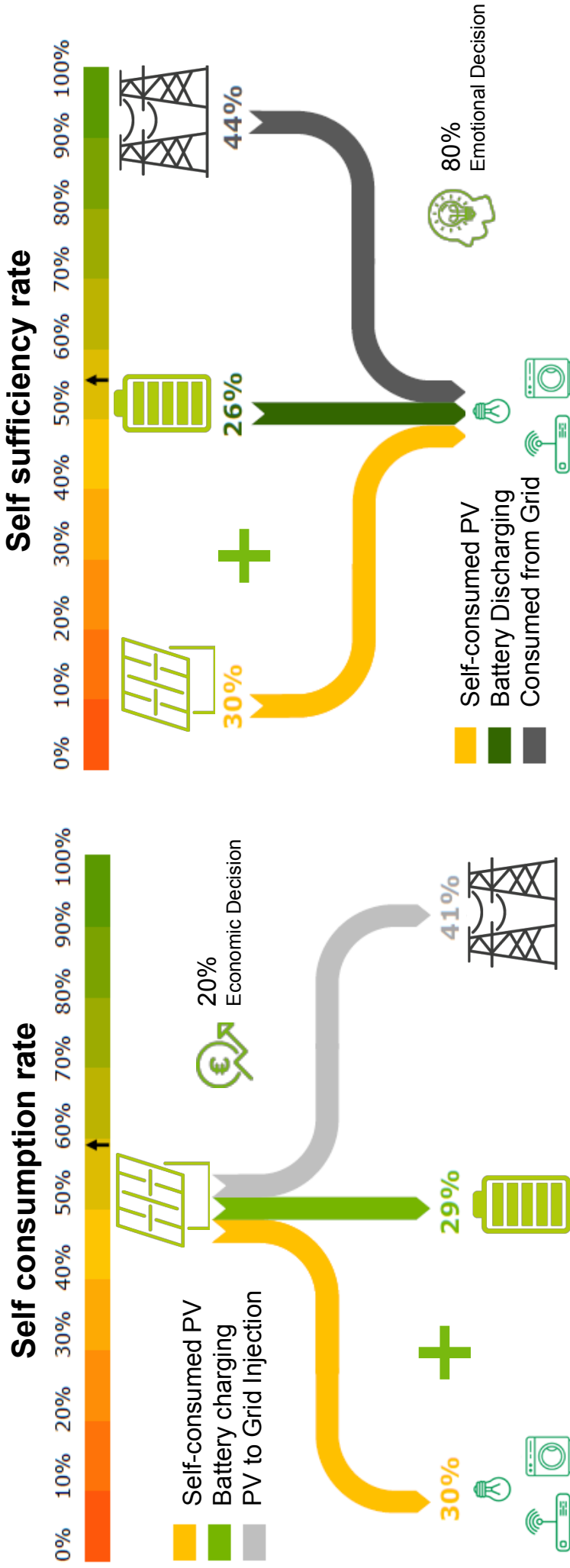


Peaks in usage associated with morning and afternoon routines.





# Self consumption rate vs. Self sufficiency rate



Example: Consumption: 4MWh; PV-Power: 4kWp; Usable Storage Capacity: 4kWh



## System sizing

- Storage Capacity [KWh] = [1,1 – 1,6] x Yearly Energy Consumption

$$\text{Battery Icon} = 1,1 - 1,6 \times \text{Lightbulb Icon}$$

The equation shows a battery icon on the left, followed by an equals sign, the numbers 1,1 and 1,6 separated by a minus sign, a multiplication sign, and a lightbulb icon on the right.

Family 1,1 – 1,35    Employed 1,35 – 1,6

### Example:

Yearly Consumption 6000 KWh

Suggested PV - > 1000KWh / KWp = 6 KWp

Battery Size:

Family -> 6 x 1,2 = **7,2 KWh** (at home during sunhours)

Employed -> 6 x 1,5 = **9 KWh** (not at home)



# System sizing tools



**h.t.w.** Unabhängigkeitsrechner

Photovoltaiksystem

Jahrestromverbrauch: 6,200 kWh

Photovoltaikleistung: 5,6 kWp

Nutzbare Speicherkapazität: 7,9 kWh

Eigenverbrauchanteil: 69%

Autarkiegrad: 58%

**KOSTAL** SOLAR ELECTRIC

Location: ...

Consumption: PV generator: ...

String-adjustment: ...

Yield: ...

Smart Connections: ...

**PV\*SOL premium**

Autarkiezeit, Klima und Netz

AC-Netz

**SUNNY DESIGN WEB**

Configure PV system

Performance: ...

Details: ...

Investor design: ...

Summary: ...

**solar edge**

DESIGNER: BAYWA R.E.

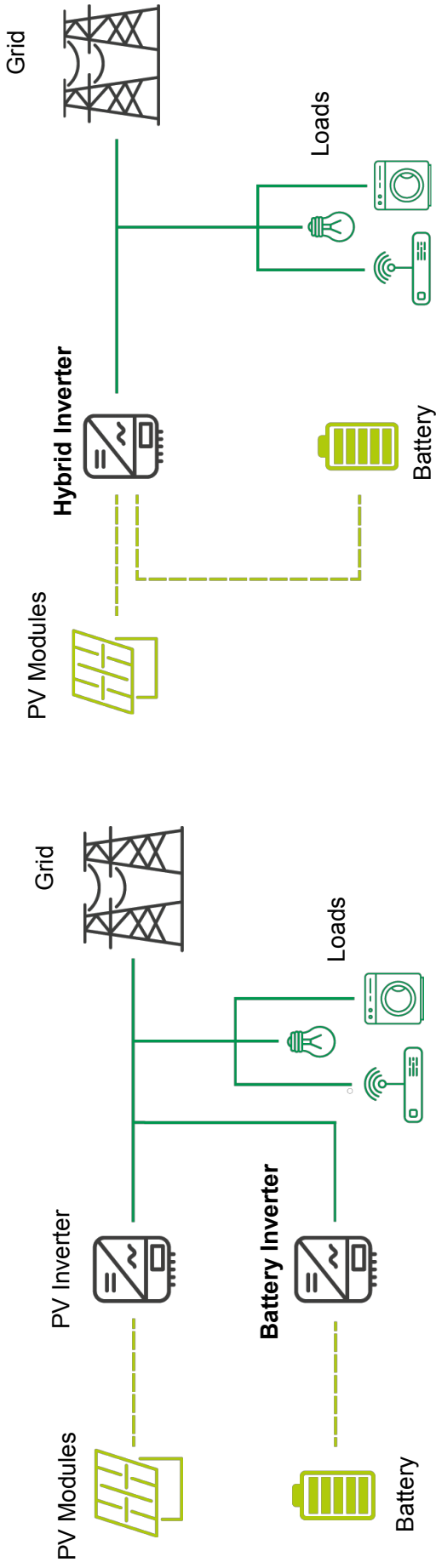
PROJECT SUMMARY: ...

SYSTEM DATA: ...

ESTIMATED MONTHLY ENERGY: ...



# AC coupled vs. DC coupled solution



AC-coupled | - - - DC | — AC

DC-coupled | - - - DC | — AC







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# Batteries





## Battery Solutions





## LG Chem Ltd.

- 226.000 employees (LG Group)
- Wall mounted solution
- NMC Cell technology
- Largest Korean chemical company
- 105,4 GWh Production capacity (146,5GWh in 2020)



© LG Chem

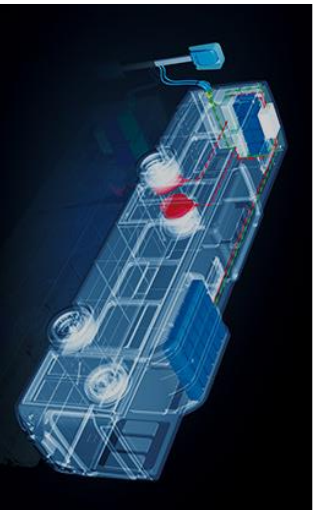




## BYD Company Limited



- 220.000 employees
- Stand alone, modular solution
- LFP Cell technology
- Chinese manufacturer of automobiles and batteries
- 40GWh Production capacity (60 GWh in 2020)
- Warren Buffett invested 230M\$ in 2008 (8%)



The BYD 12m ebus for Brussels Airport Company

© BYD <http://bydeurope.com/article/280>

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## BMZ Group

- 3000 employees
- Stand alone solution
- NMC / NCA Cell technology
- Made in Germany



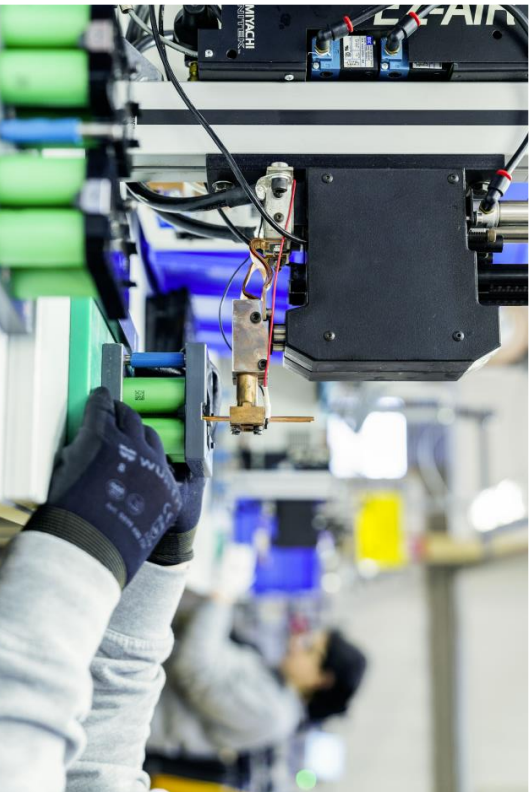
© BMZ





## VARTA AG

- 2290 employees
- Stand alone & wall mounted solution
- NMC Cell technology (residential)
- Made in Germany
- Up to 20.000 systems per year
- 130 years of company history



© Varta AG





# From Cell to Battery

Cell



Module



Battery



LFP – Prismatic Cell



NMC – Pouch Cell





# From Cell to Battery

Cell



Module



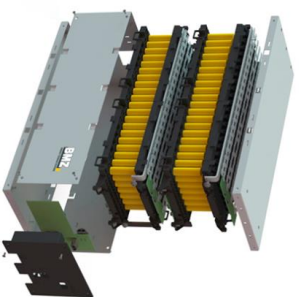
Battery



NMC – Cylindric Cell



NMC – Pouch Cell







# Warranty



Product Type	Usable Energy(kWh) <sup>1</sup>	Minimum Through Output Energy (MWh)
Battery-Box H 6.4	6.4	18.2
Battery-Box H 7.7	7.68	21.8
Battery-Box H 9.0	8.96	25.4
Battery-Box H 10.2	10.24	28.4
Battery-Box H 11.5	11.52	32.0



Product Name	Nominal Energy	Energy Throughput
RESU7H	7.0kWh	19.6MWh
RESU10H	9.8kWh	27.4MWh



Warranty only with certified installers  
Registration on LG Chem portal  
From 1st of october !

- Product Warranty: 10 years
- Performance warranty: min 60% of usable energy after 10y from invoice date  
or minimum Through Output Energy (~2800 Cycles in 10y)



- Product Warranty: 10 years
- Performance warranty : 5000 Cycles in 10y
- Product Warranty: 10 years
- Performance warranty : 4000 Cycles in 10y (min 80%)



# Recycling



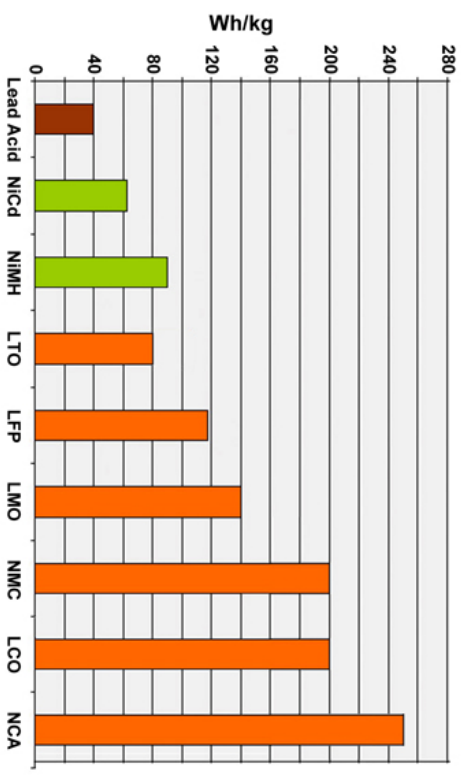
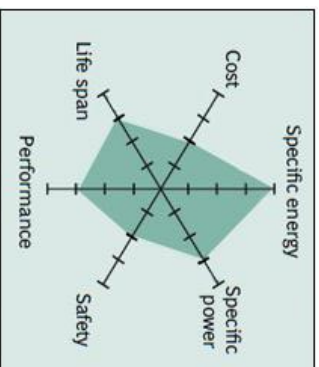
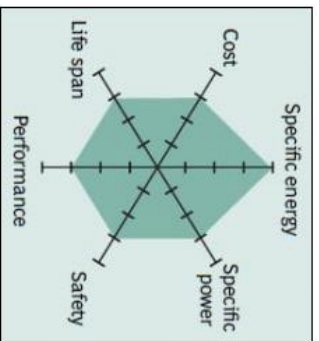
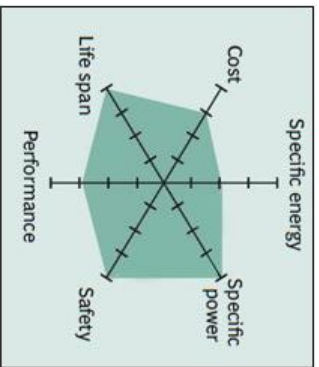
A Landbell Group Company



<https://www.heise.de/newsticker/meldung/Lithium-aus-dem-Schredder-4451133.html>



# Raw material



© <https://batteryuniversity.com>

## IEC 62619 - Safety Requirements for secondary lithium cells and batteries VDE-AR-E 2510-50 Safety requirements for stationary battery storage systems

<https://ledison.handelsblatt.com/erklaren/lithium-aus-lateinamerika-umweltfreundlicher-als-gedacht/24022826.html>

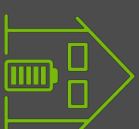
<https://www.volker-quaschnig.de/artikel/Fakten-Auto/index.php>



BayWa r.e.

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# Residential Solutions





## Inverter Solutions





# Sunny Boy Storage 2.5 – 3.7 – 5.0 – 6.0



- 1Ph~ High Voltage
- Self Consumption
- Back-up (for 3.7-6.0 from Q1 2021)
- SPS Secured Power Supply
- AC coupled solution
- 3 Inputs for batteries (for 3.7-6.0)



Sunny Home Manager 2.0



Premium  
 HVS 5.1 – 10.2  
 HVM 8.3 – 22.1  
 Check compatibility

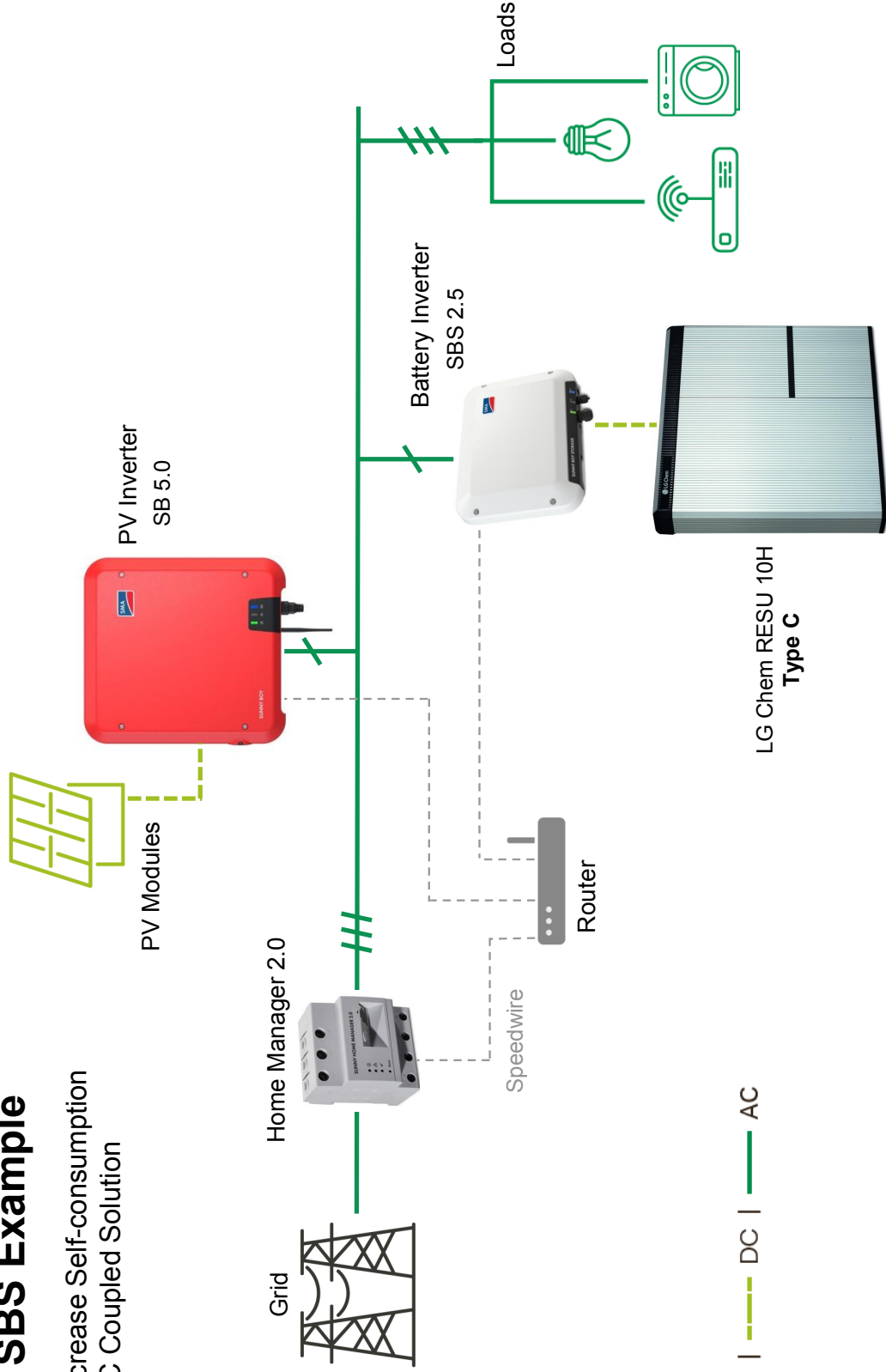


RESU10M  
 Only for 3.7  
 RESU7H  
 RESU10H  
 Type C



# SMA SBS Example

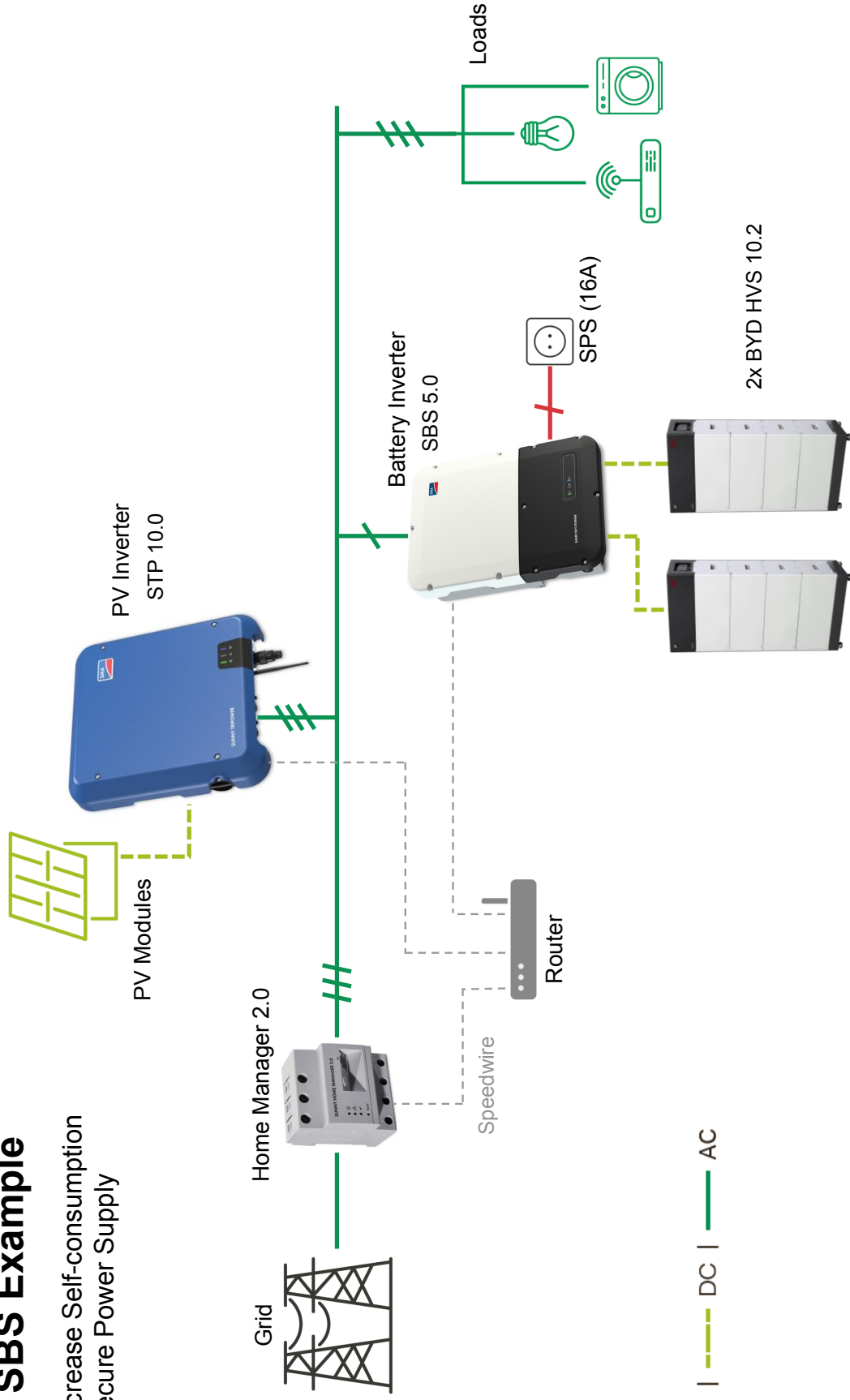
- Increase Self-consumption
- AC Coupled Solution





# SMA SBS Example

- Increase Self-consumption
- Secure Power Supply







# Sunny Island 4.4M – 6.0H – 8.0H



Sunny Home Manager 2.0

- 1Ph~ Low Voltage
- Offgrid, Back-up & Self Consumption
- AC coupled



Premium LVS  
3.84 – 23.0  
*Check compatibility*



RESU  
3.3 - 13



Premium LVL  
15.4

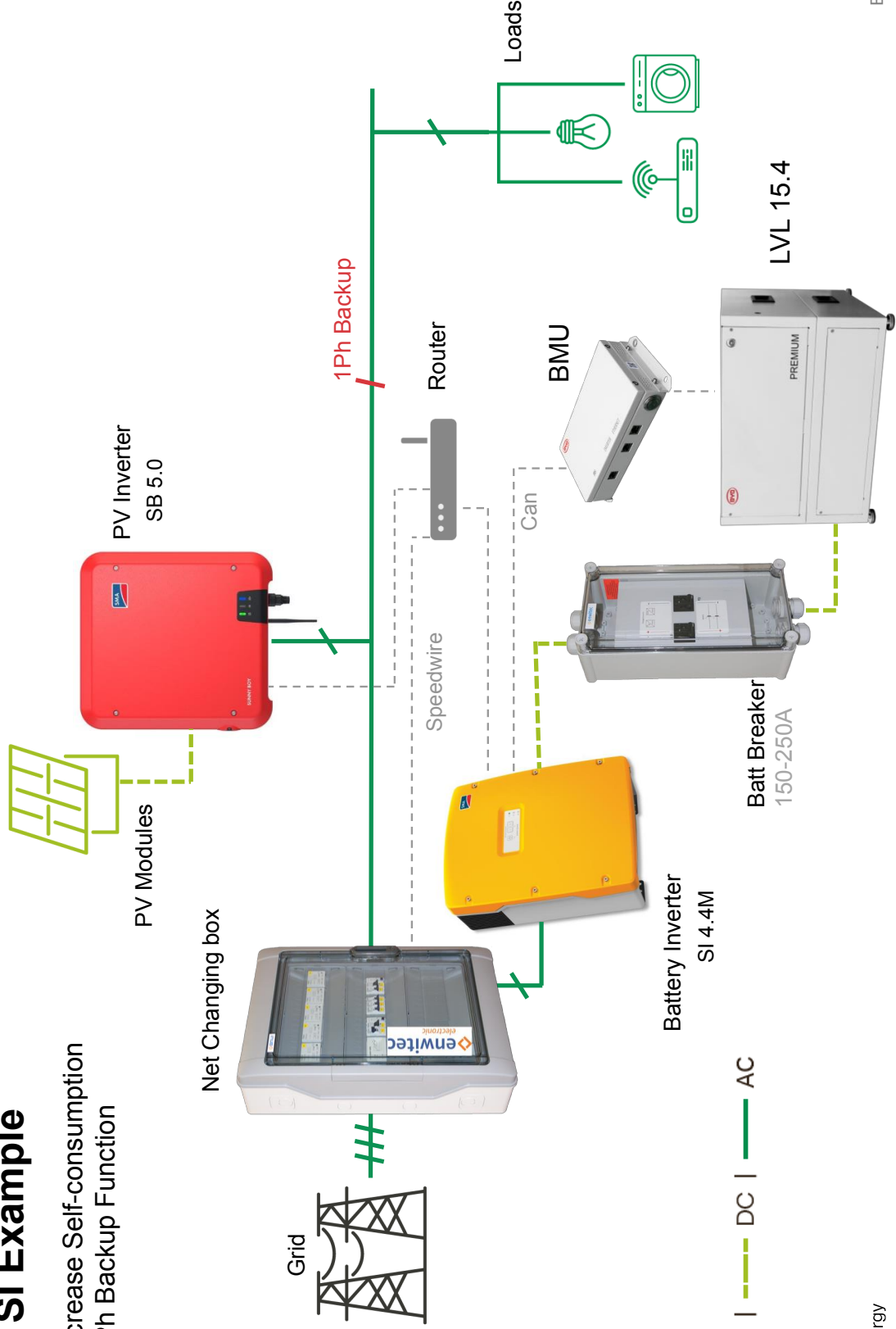


ESS 7.0 – ESS X



# SMA SI Example

- Increase Self-consumption
- 1Ph Backup Function





# StoreEdge SE2200H – SE5000H / SE3680H – SE 5000H (AC)



Sesti 4

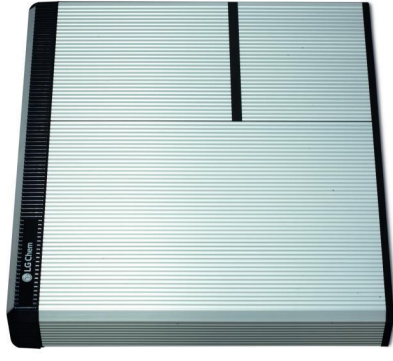


RWS Version



Energy Meter w. Modbus  
Current Transformer 50-1000A

- 1Ph~ High Voltage
- Self Consumption
- DC or AC coupled
- Optimizer solution
- Sesti integrated from 2020

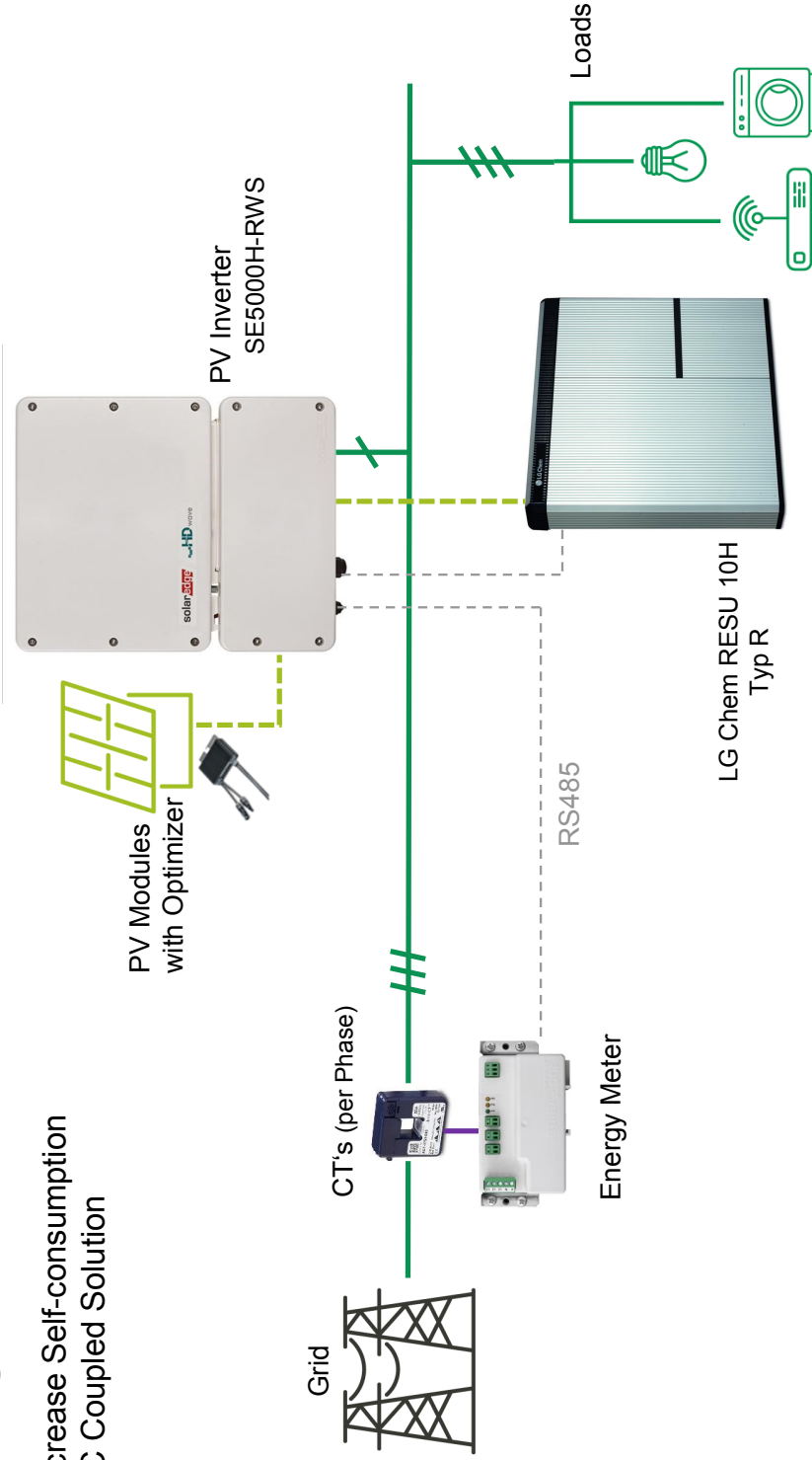


RESU 7H – 10H  
Type R



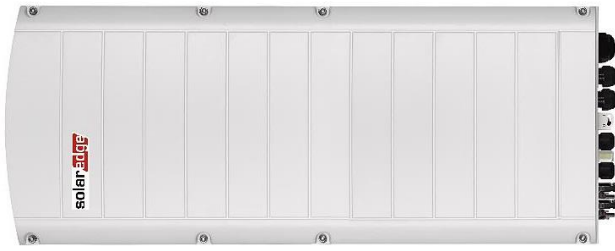
# SolarEdge Example

- Increase Self-consumption
- DC Coupled Solution





# StoreEdge Three Phase 5K - 7K - 8K - 10K



- 3Ph~ Low Voltage
- Self Consumption
- DC coupled
- Optimizer solution



Energy Meter w. Modbus  
Current Transformer 50-1000A



Premium LVS  
3.84 – 23.0  
[Check compatibility](#)

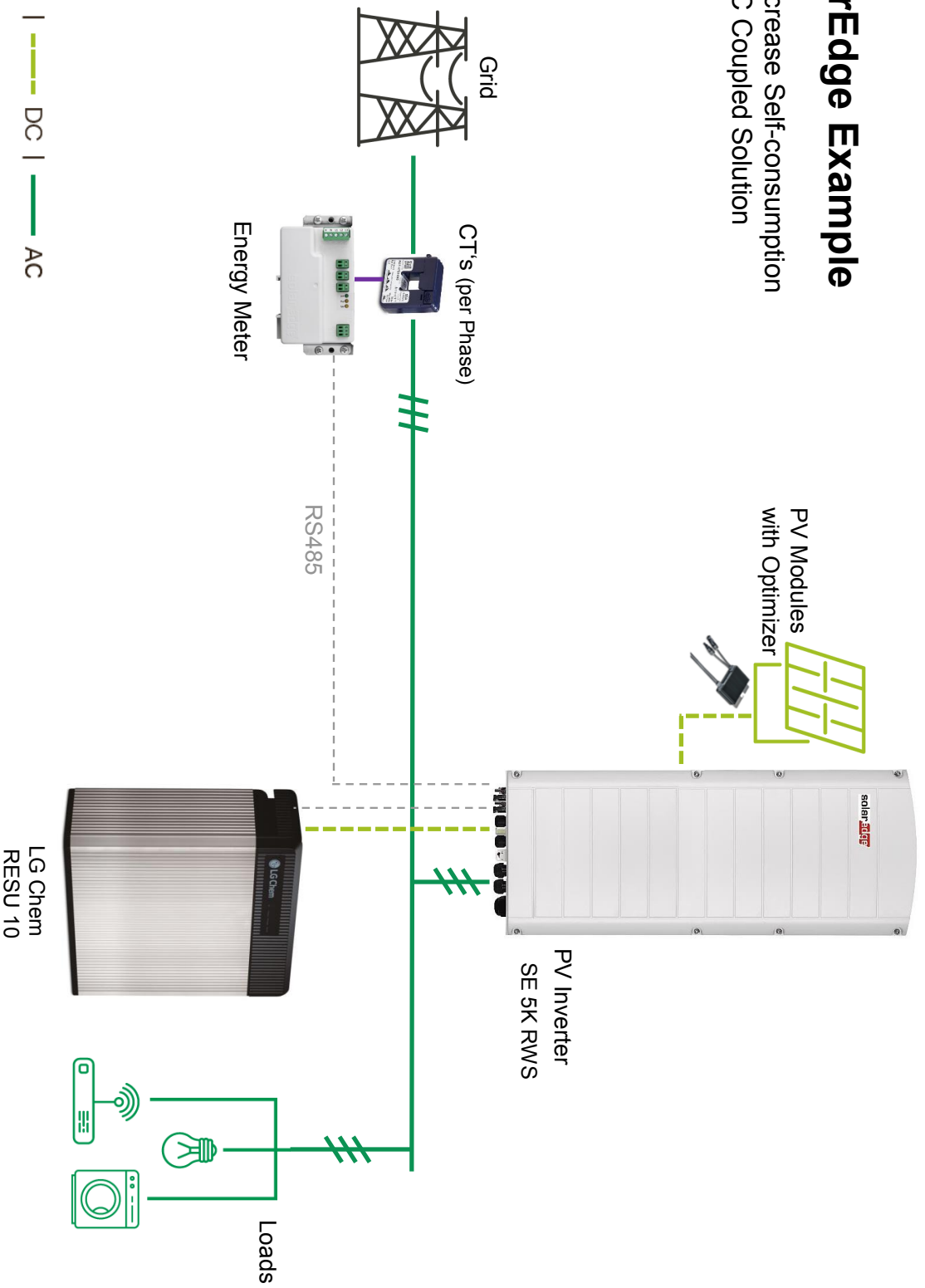


RESU 3.3 - 13



# SolarEdge Example

- Increase Self-consumption
- DC Coupled Solution





# SUN2000 2KTL – 3KTL – 3.68KTL – 4KTL – 4.6KTL – 5 KTL – 6KTL L1 Version



- 1Ph~ High Voltage
- Self Consumption
- DC coupled
- 2 MPPT's



Smart Power Sensor  
DTSU666-H  
(250A)



Smart Dongle  
4G



Smart Dongle  
Wlan / FE



Optimizer  
Sun2000-450W



Luna 2000 5/10/15-S0  
Available from 11/2020

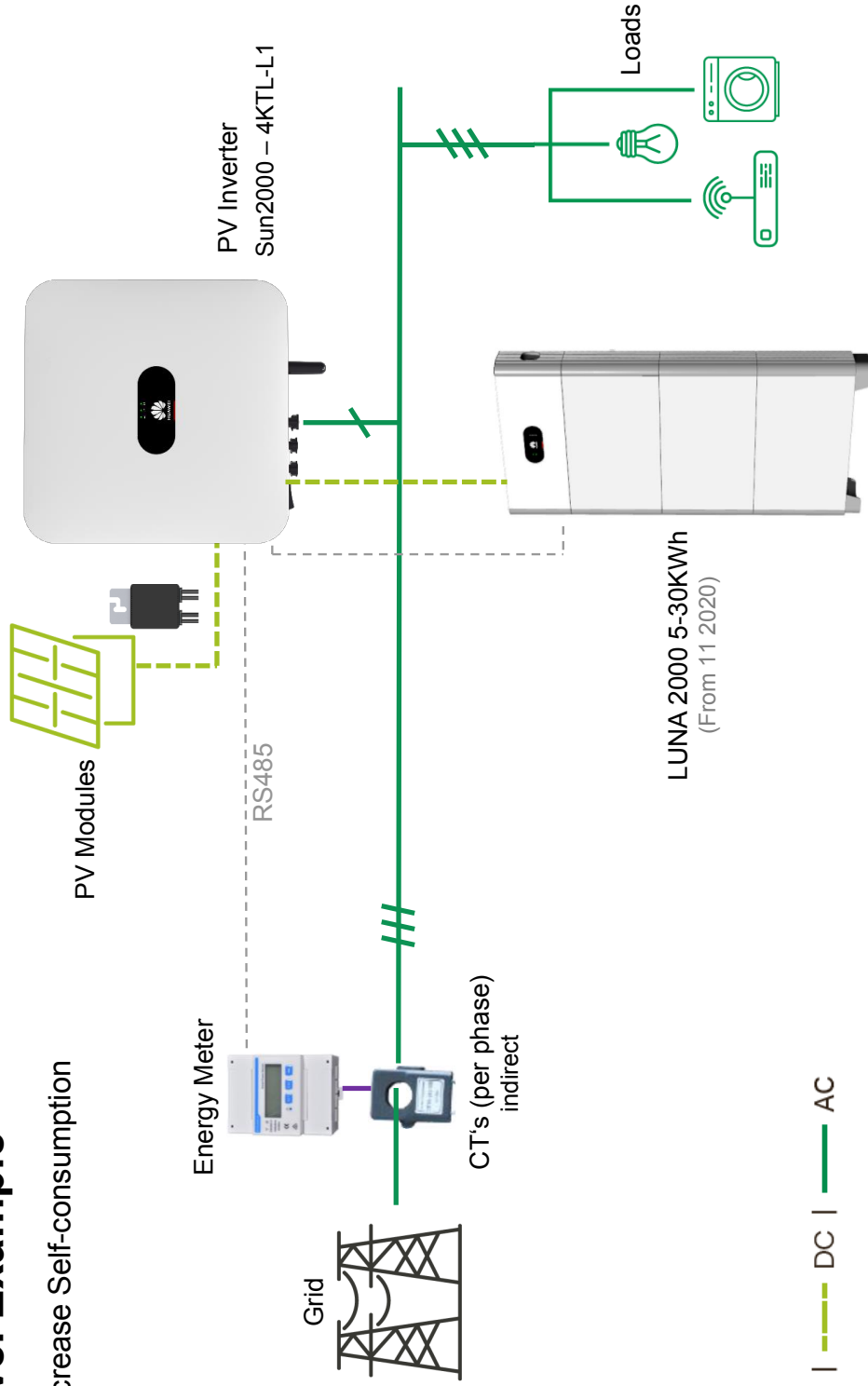


RESU 7H – 10H  
Type R



# Huawei Example

- Increase Self-consumption







# SUN2000 3KTL – 4KTL - 5 KTL - 6KTL – 8KTL – 10KTL M2 Version



- 3Ph~ High Voltage
- Self Consumption
- DC coupled
- 2 MPPT's
- Available from 11/2020



Smart Power Sensor  
DTSU6666-H



Smart Dongle  
4G



Smart Dongle  
Wlan / FE



Optimizer  
Sun2000-450W



RESU 7H – 10H  
Type R

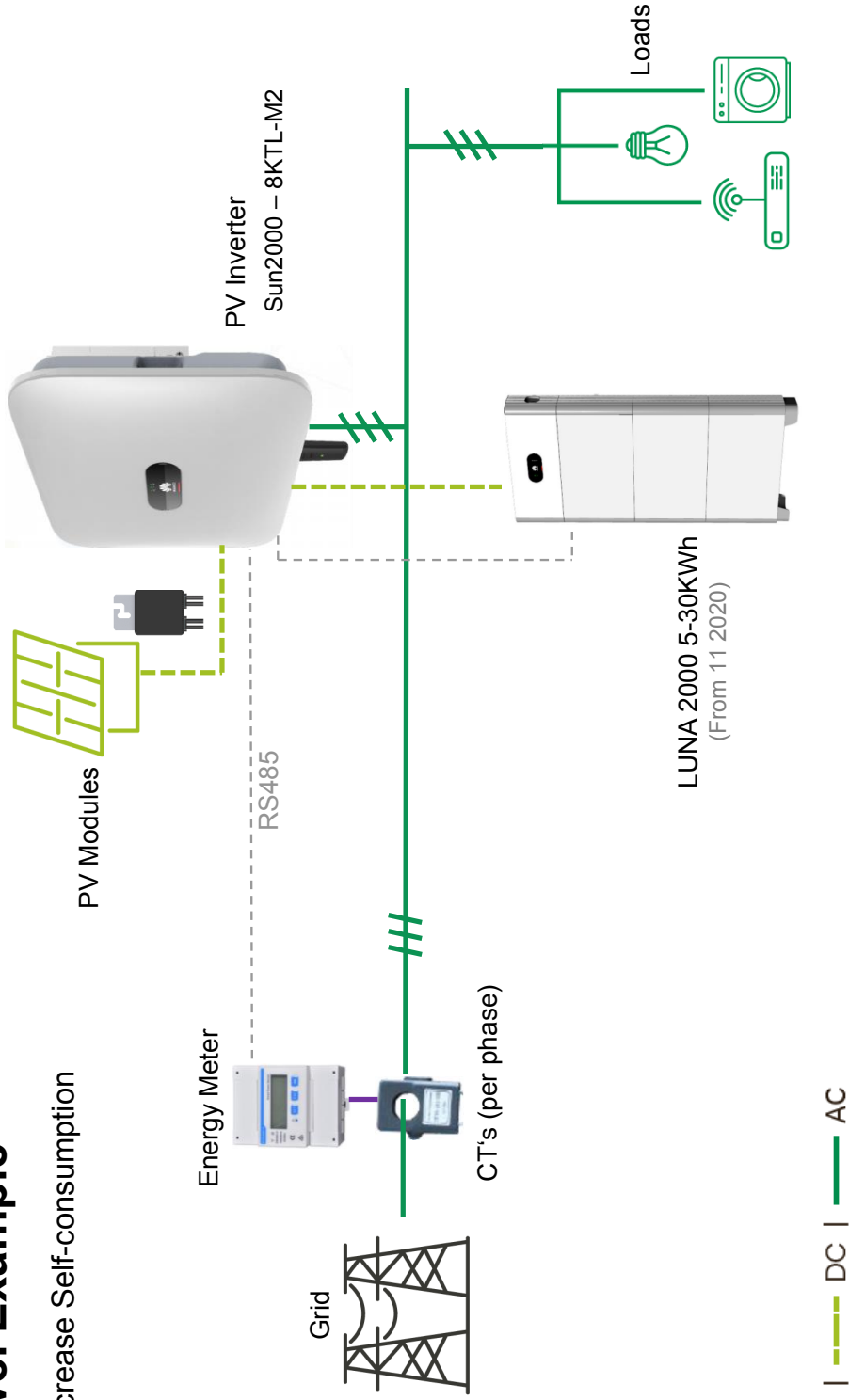


LUNA2000 5/10/15-S0  
Available from 11/2020



# Huawei Example

- Increase Self-consumption





# Pulse 3 – 6 ; Element 3 - 12



- 1Ph & 3Ph ~ Low Voltage
- Self Consumption
- AC coupled
- Pulse Neo coming
- No Synergrid ed2.1!



Split Core  
Current Sensor  
3x 50A



Varta Link 63A



RJ12

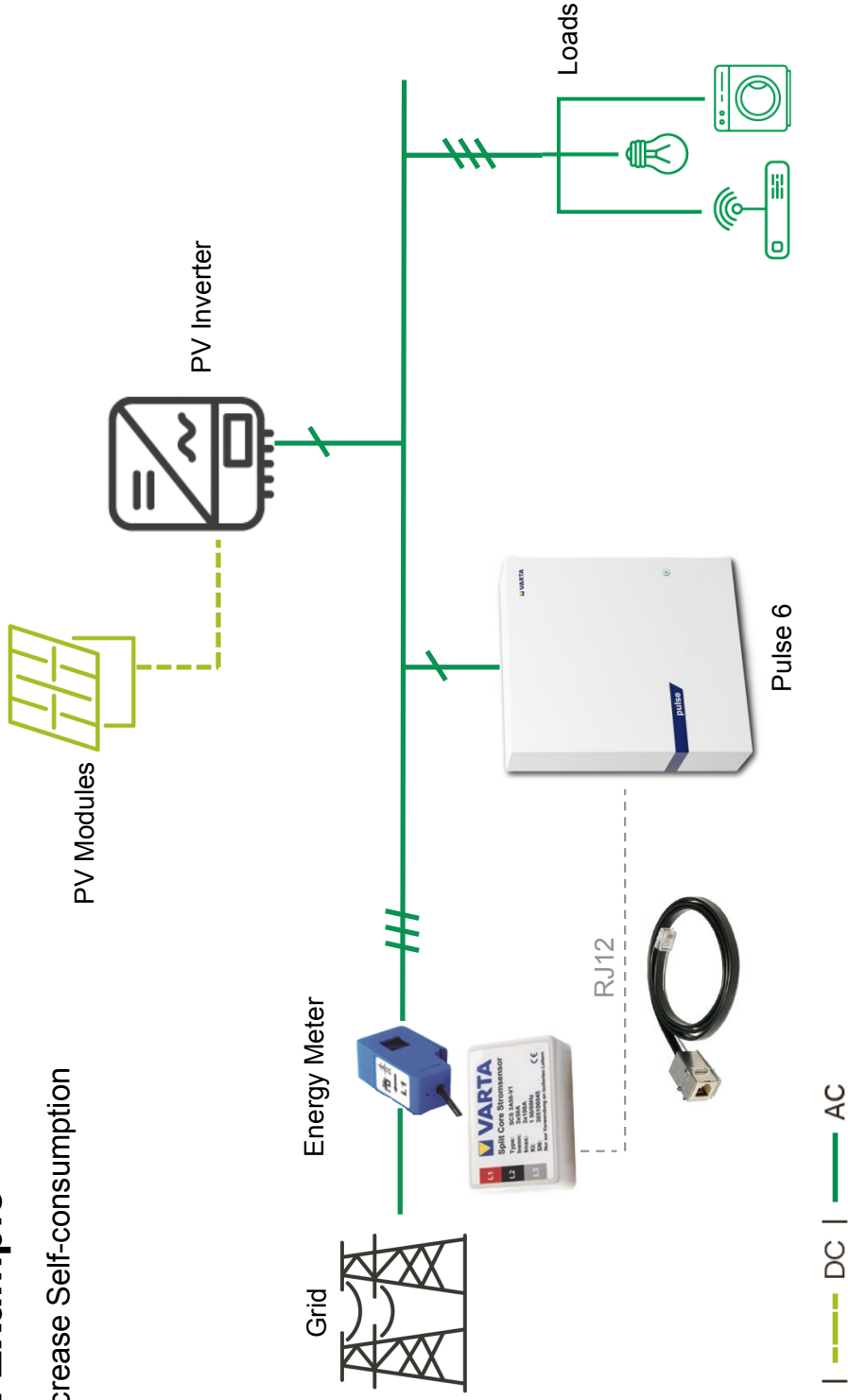


Solar-Log 50



# Varta Example

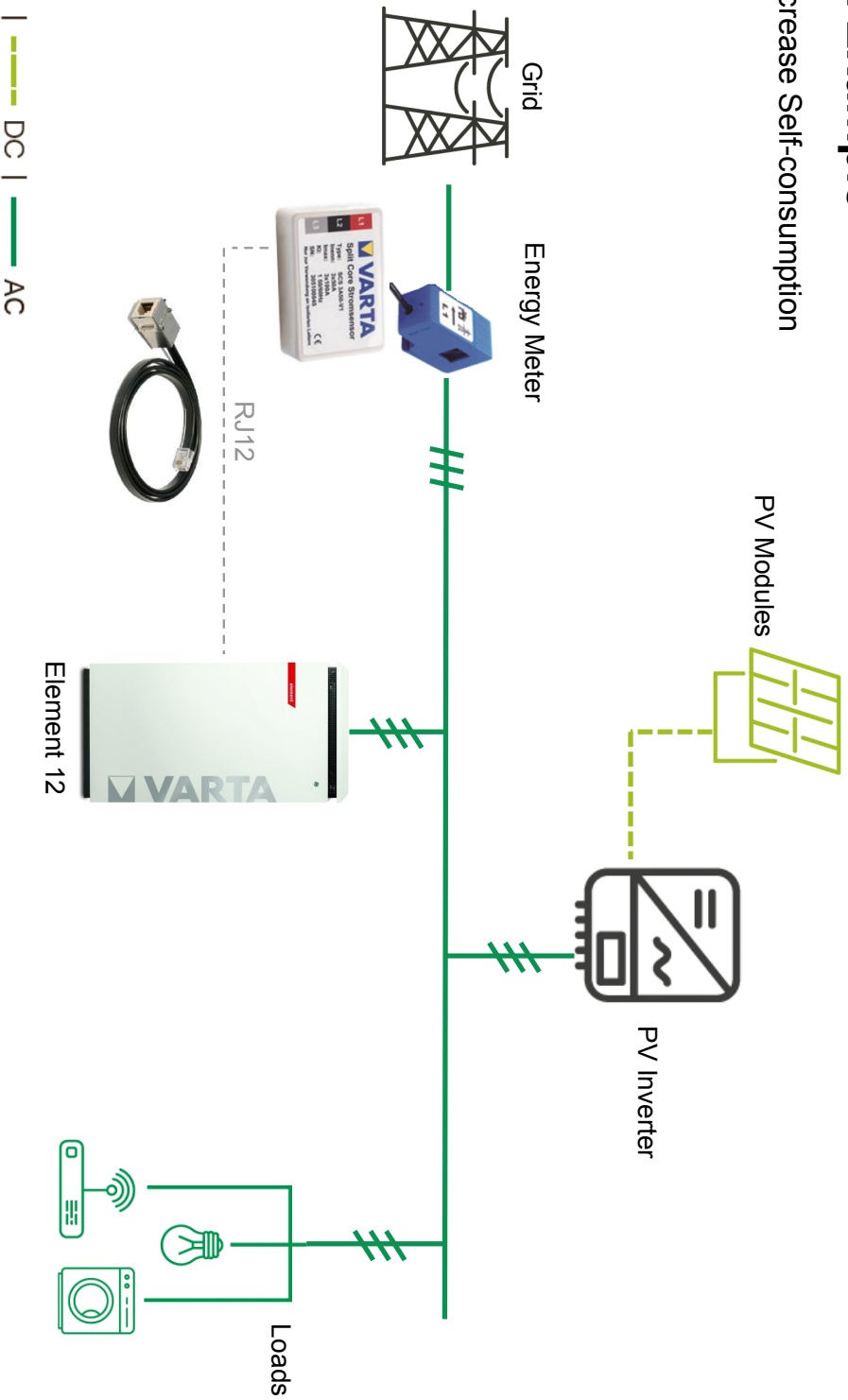
- Increase Self-consumption





# Varta Example

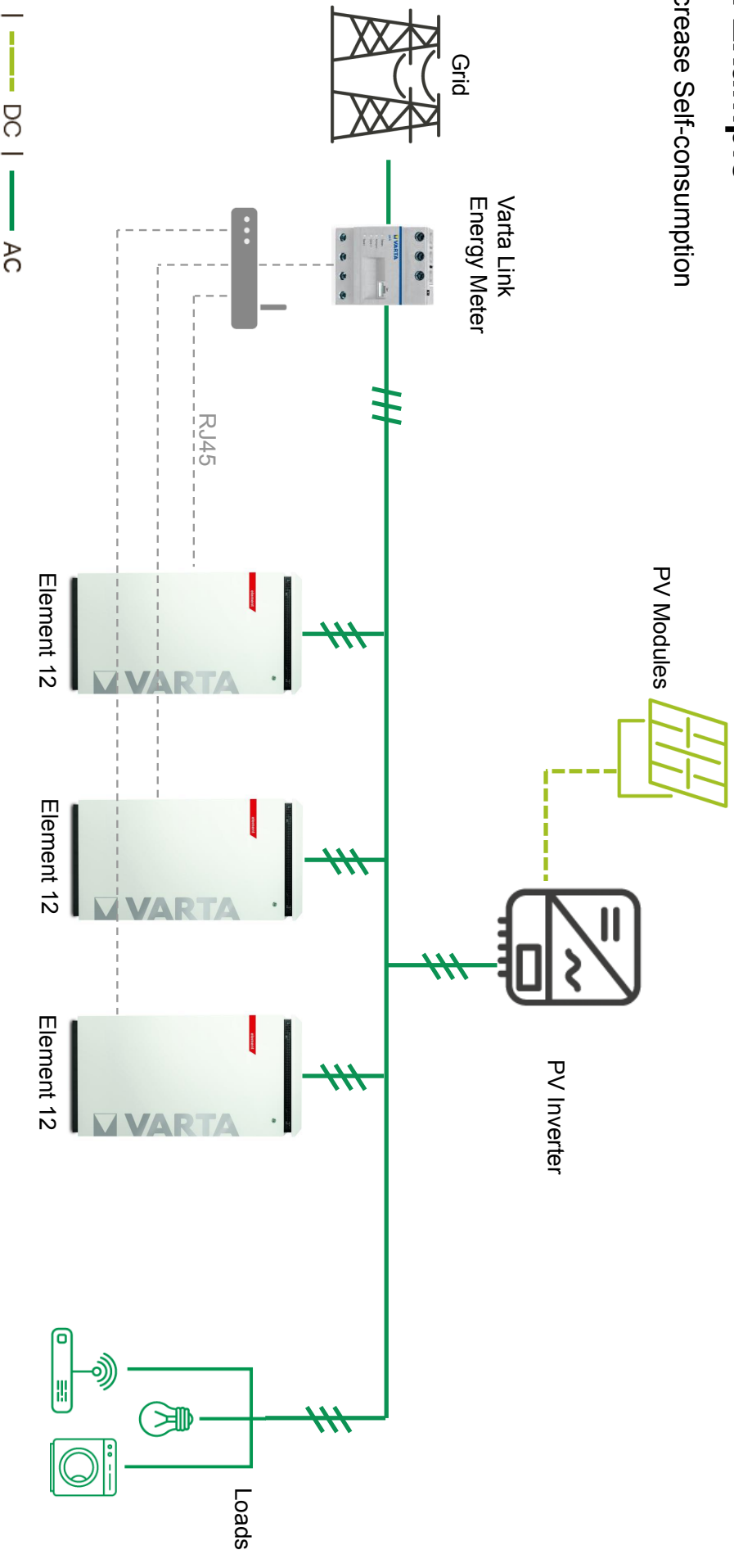
- Increase Self-consumption





# Varta Example

- Increase Self-consumption





**PIKO MP plus 1.5-1 – 2.0-1 – 2.5-1 – 3.0-1 – 3.6-1 / 3.0-2 – 3.6-2 – 4.6-2**

**KOSTAL**



- 1Ph~ High Voltage
- Self Consumption
- AC or DC coupled
- 1 / 2 MPPT's (1 for battery)



**Kostal Smart Energy Meter**



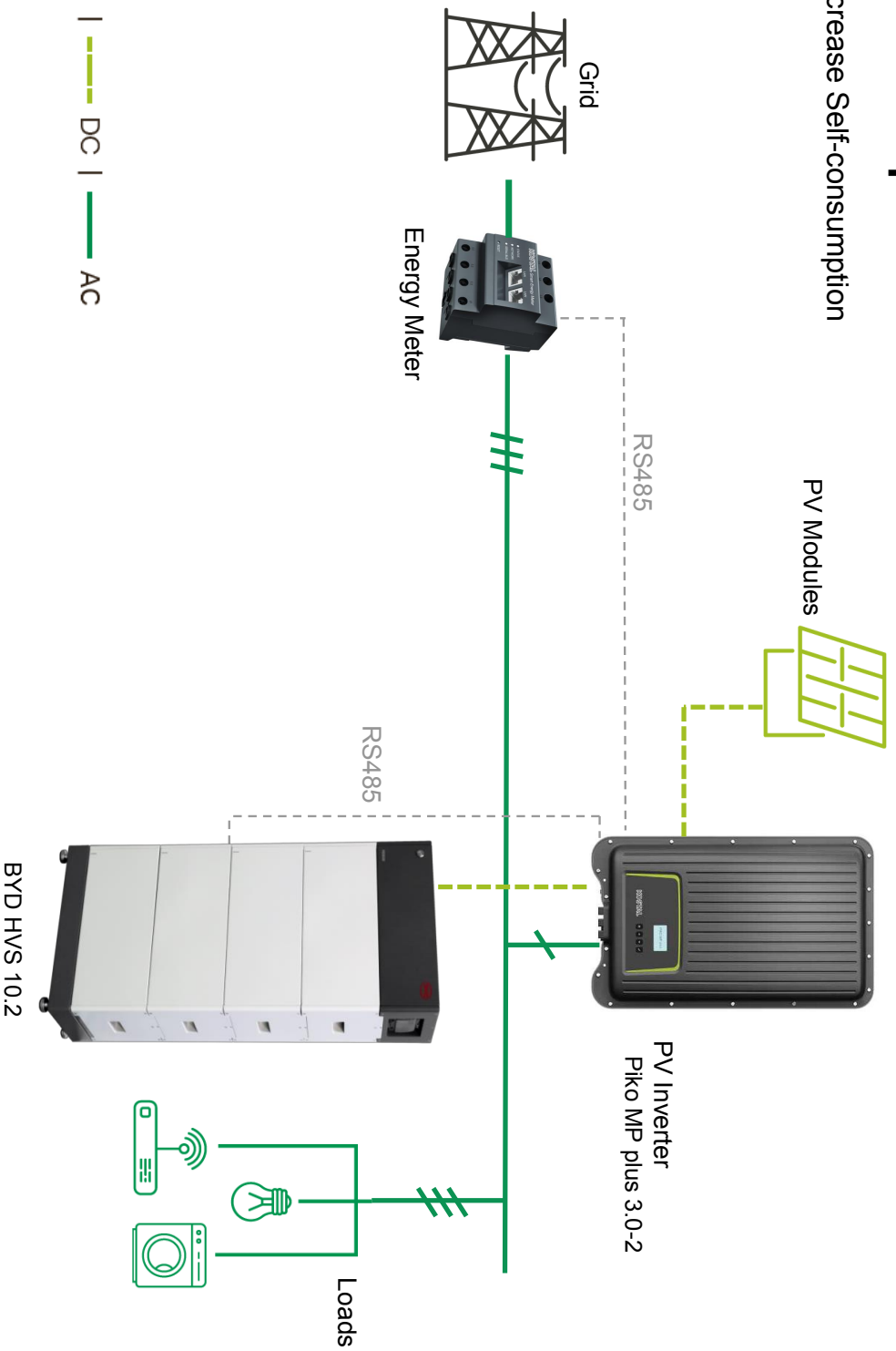
**Premium**  
**HVS 5.1 – 10.2**  
**HVM 8.3 – 22.1**



# Kostal Example

KOSTAL

- Increase Self-consumption







## Plenticore Plus 3.0 – 4.2 – 5.5 – 7.0 – 8.5 – 10

# KOSTAL



- 3Ph~ High Voltage
- Self Consumption
- AC or DC coupled
- 3 MPPT's (1 for battery – w/ Activation code)



Kostal Smart Energy Meter



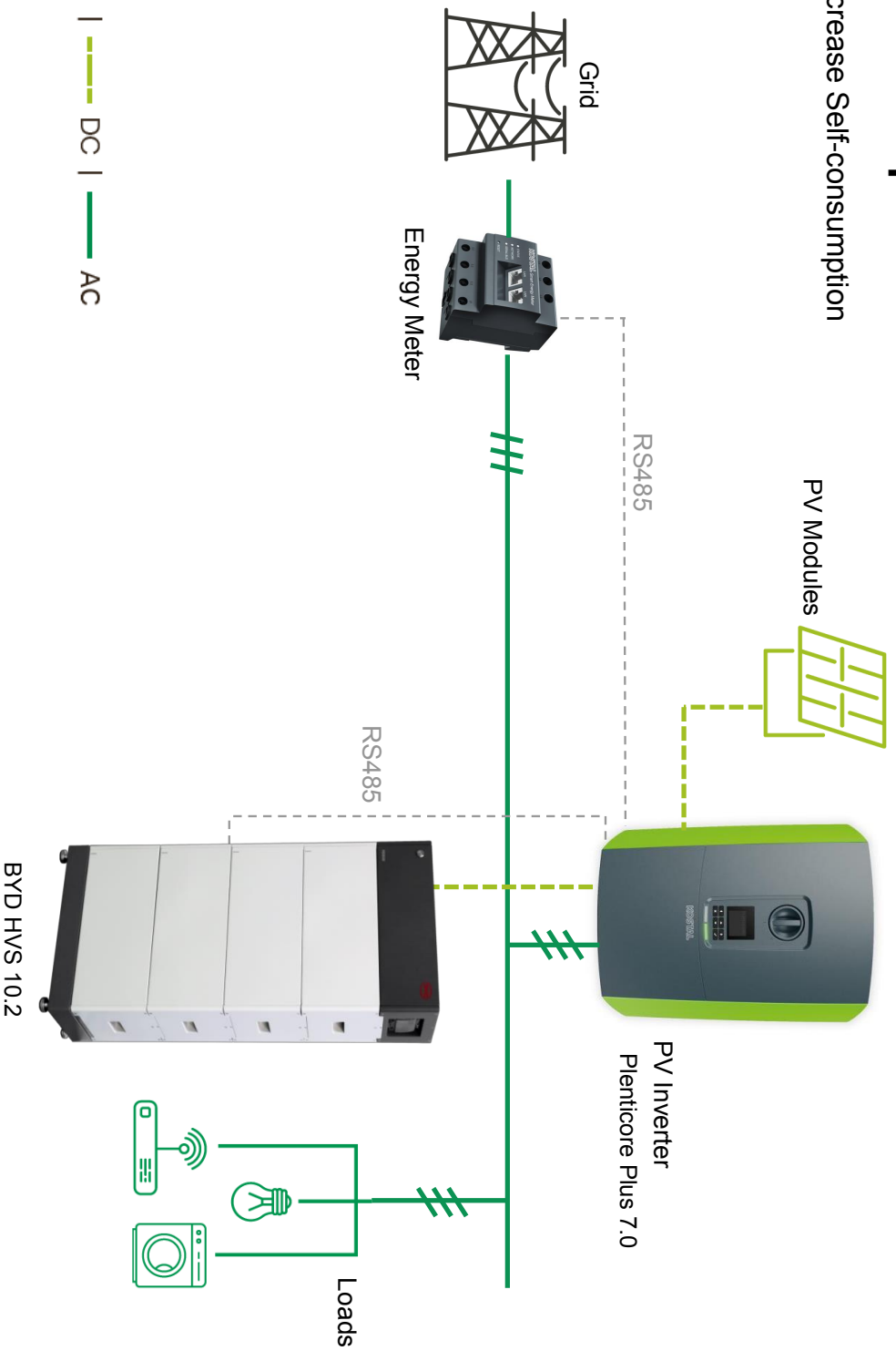
**Premium**  
 HVS 5.1 – 12.8 (2~5)  
 HVM 13.8 – 22.1 (5~8)



# Kostal Example

KOSTAL

- Increase Self-consumption





# Symo Hybrid 3.0-3-S – 4.0-3-S – 5.0-3-S



- 3Ph~ High Voltage
- Self Consumption
- Back-up (with BYD)
- AC or DC coupled
- 1 MPPT



Smart Meter 63A-3



Checkbox with LG Chem



RESU 7H – 10H  
Type R



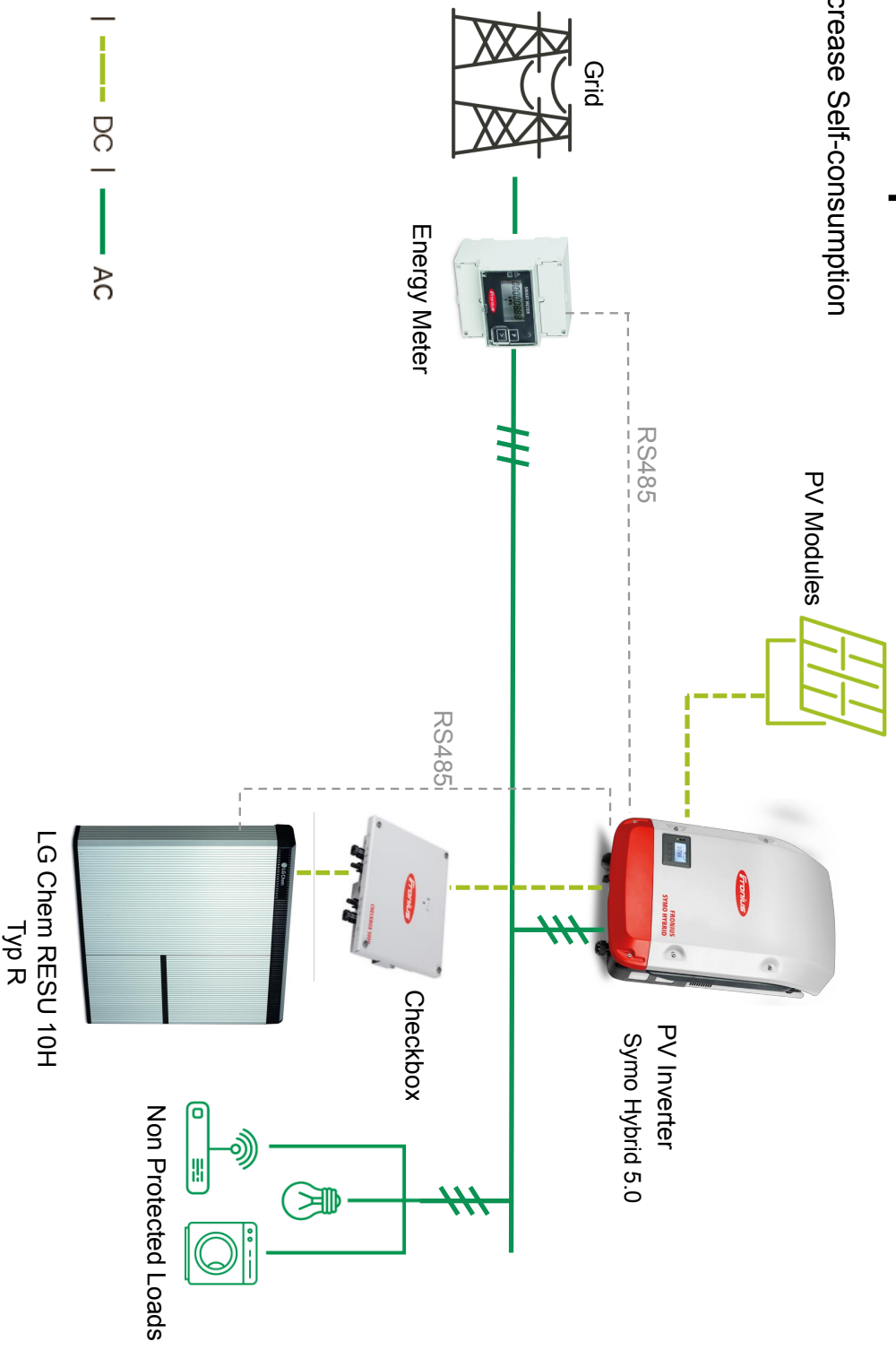
Premium  
HVM 8.3 – 22.1 (3~8)



# Fronius Example



- Increase Self-consumption

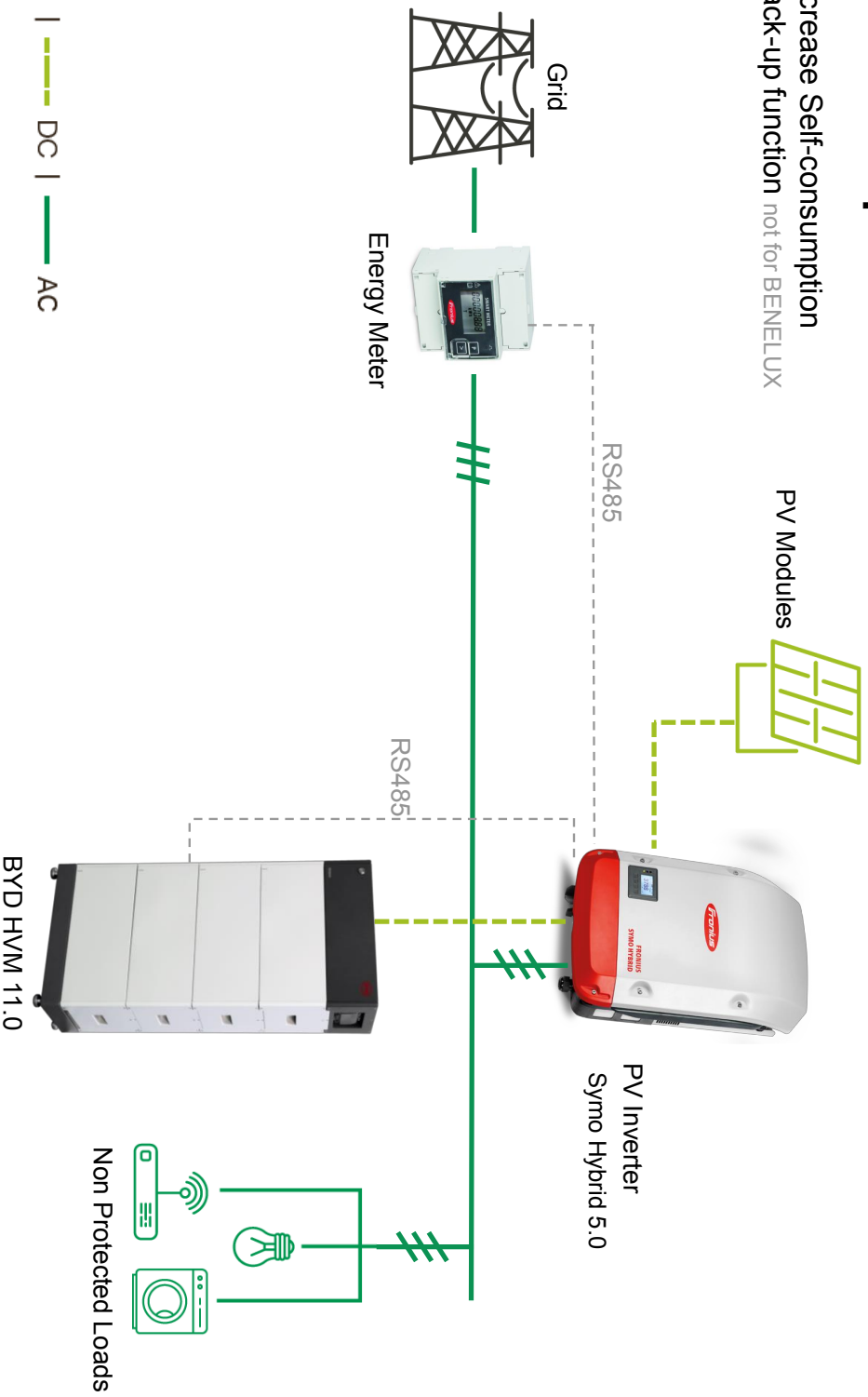




# Fronius Example



- Increase Self-consumption
- Back-up function not for BENELUX





# Primo GEN24 Plus 3.0 – 3.6 – 4.0 – 4.6 – 5.0 – 6.0



- 1 Ph~ High Voltage
- Self Consumption
- Back-up (with BYD)
- AC or DC coupled
- 2 MPPT's
- PV Point
- **From Q1 2021**



RESU 7H – 10H  
**Type R**  
 Not compatible yet



Premium  
 HVS 5.1 - 7.7 (2~3)  
 HVM 11.0 – 19.3 (4~7)



Smart Meter 63A-3



# Symo GEN24 Plus 6.0 – 8.0 – 10.0



- 3Ph~ High Voltage
- Self Consumption
- Back-up (with BYD)
- AC or DC coupled
- 2 MPPT's
- PV Point
- **From 09 - 2020**



RESU 7H – 10H  
**Type R**  
 Not compatible yet



Premium  
 HVS 5.1 - 7.7 (2~3)  
 HVM 11.0 – 22.1 (4~8)



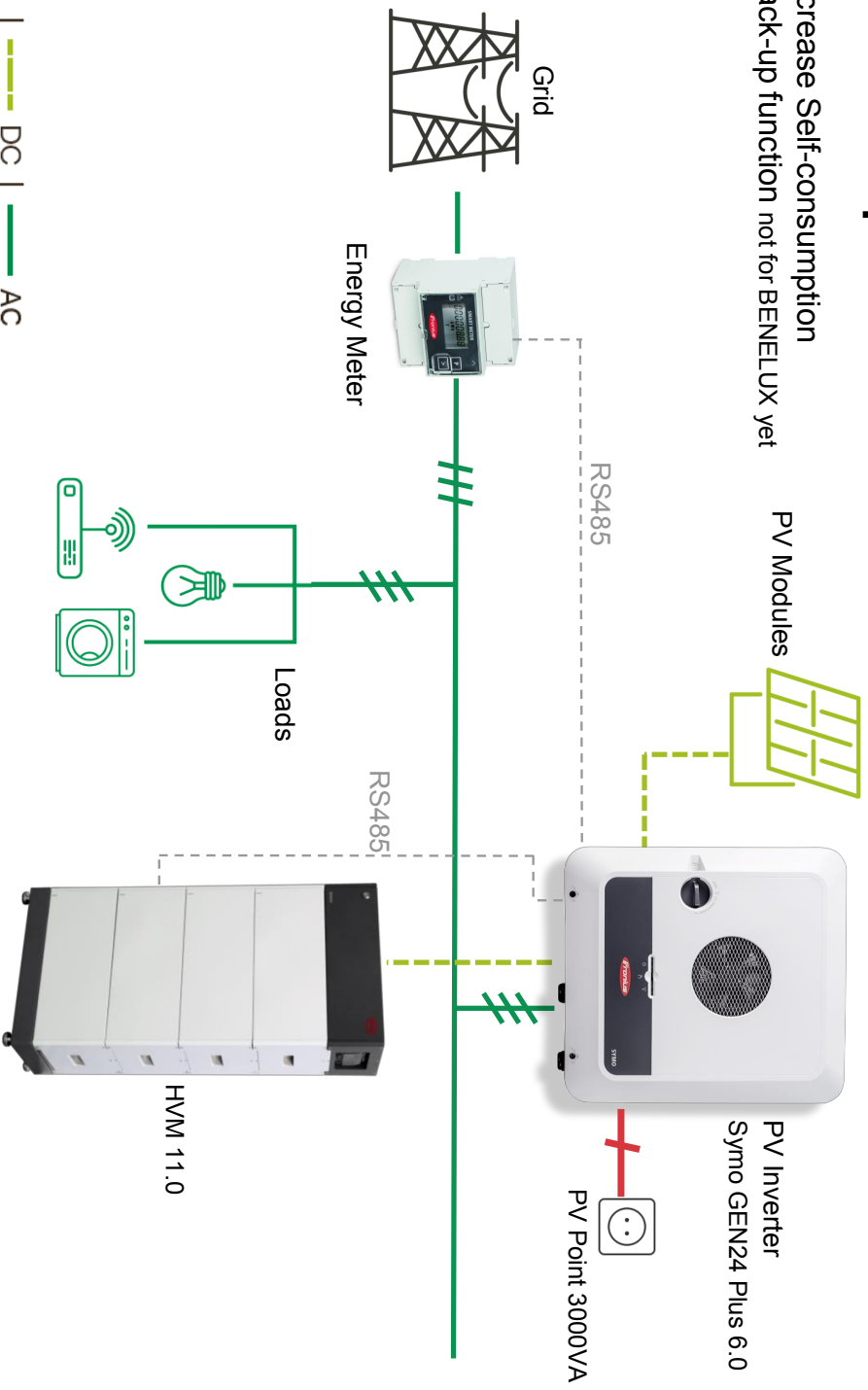
Smart Meter 63A-3



# Fronius Example



- Increase Self-consumption
- Back-up function not for BENELUX yet







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