

## Innovative AC/DC-coupled PV-Wind-Battery Micro-Grid System for a Manufacturing Facility in Germany

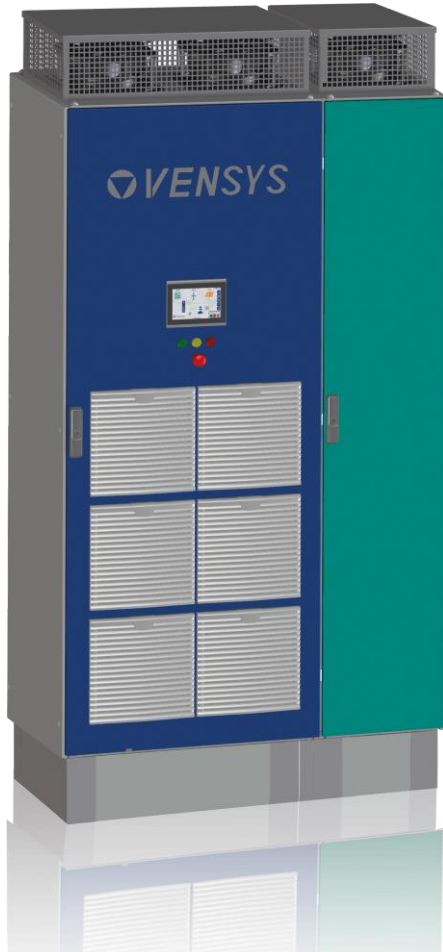
Donnerstag, 20. Mai 2021

Guluma F. Megersa

5th International Hybrid Power Systems Workshop



# Agenda

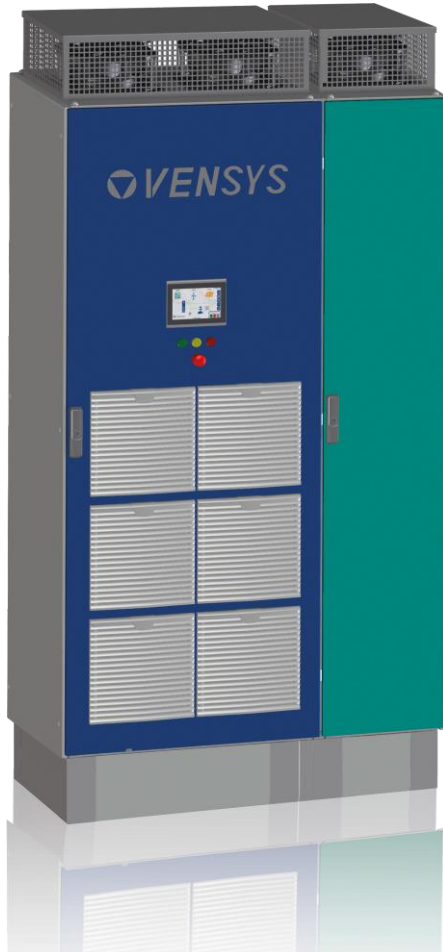


Brief company presentation

Introduction to VENCON – VENSYS Hybrid Converter

Hybrid Micro Grid project example

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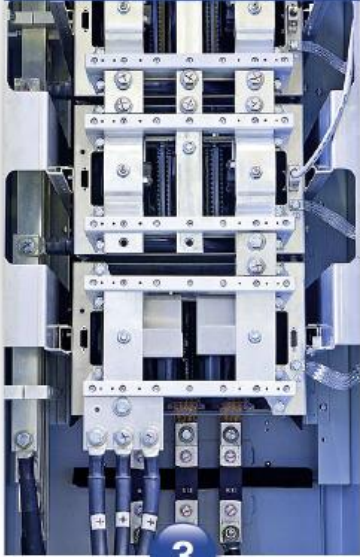

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# Introduction VENSYS

VENSYS Group at a glance

DEVELOPMENT AND LICENCE BUSINESS	WIND POWER PLANTS Production	ELECTRIC COMPONENTS Development+ production	WIND FARM DEVELOPMENT Project development
 <p>1</p>	 <p>2</p>	 <p>3</p>	 <p>4</p>

# Introduction VENSYS

More than 55 GW installed with our direct drive wind turbine technology



# Introduction VENSYS

## Locations



VENSYS Energy AG  
Headquarter - Neunkirchen (GER)



VENSYS Elektrotechnik GmbH  
Production (Electrotechnical) - Diepholz (GER)



VENSYS Energy AG  
Production (WEC) - Neunkirchen (GER)



Eblades Technology SL.  
Production (Blades) - Granada (ESP)

# Introduction VENSYS

## History of VENSYS Elektrotechnik GmbH

- **2008** Establishment of VENSYS Elektrotechnik  
Electrical components and power electronics for wind turbines
- **2011** Start in the PV sector: VENSYS solar inverter
- **2014** Built the first integrated storage system on VENSYS site
- **2015** Development of VENSYS Lithium-Ion Storage System
- **2017** Launch of Outdoor Storage System
- **2019** Launch of VENCON Hybrid Converter
- **2021** Awarded as top innovator within the TOP100 competition



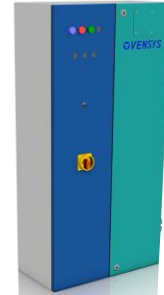
# Introduction VENSYS

VENSYS Elektrotechnik Products

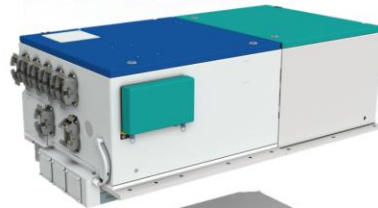
VENSYS High Power Converters



VENSYS Topbox



VENSYS Pitch Systems

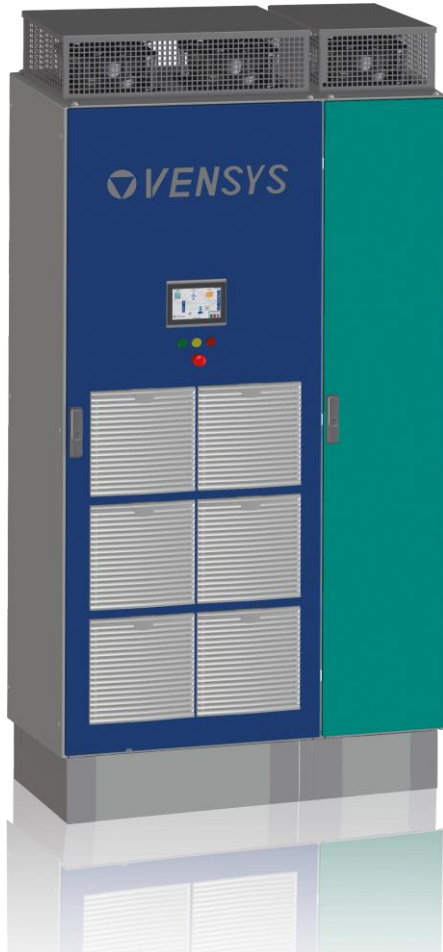


VENSYS Hybrid Converter





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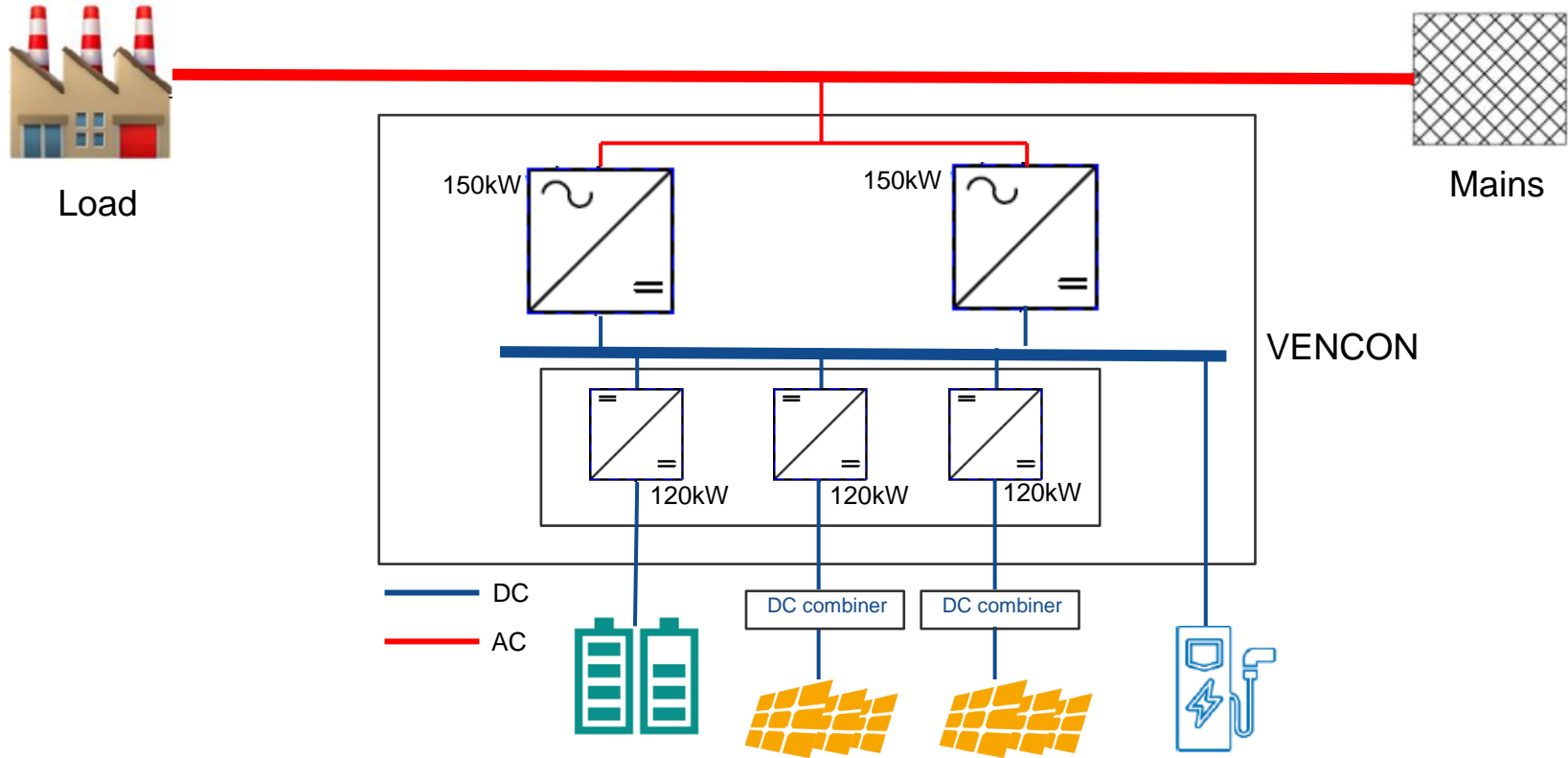
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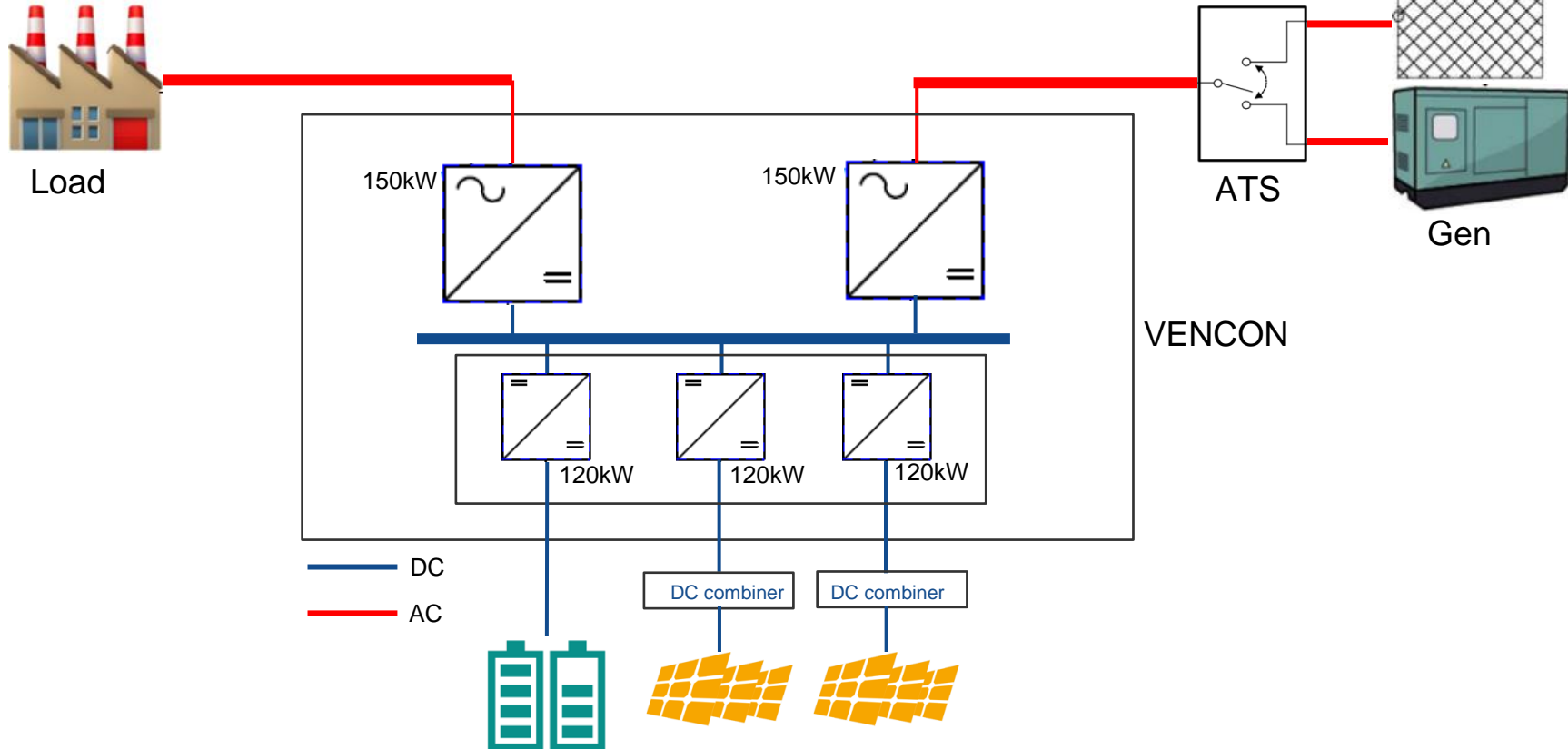
# Introduction to VENCON – VENSYS Hybrid Converter

Power conversion possibilities with the VENCON (on-grid)



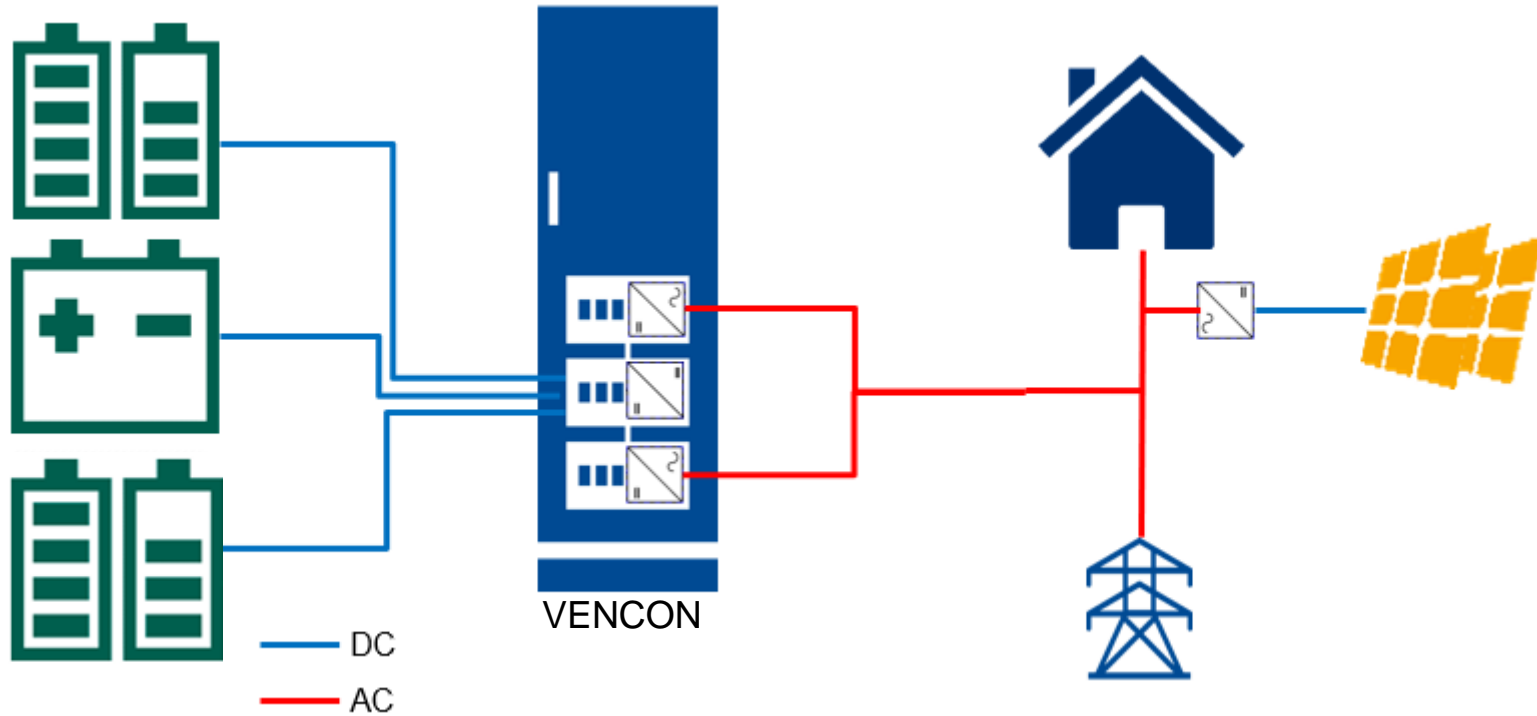
# Introduction to VENCON – VENSYS Hybrid Converter

Power conversion possibilities with the VENCON (off-grid/micro-grid)



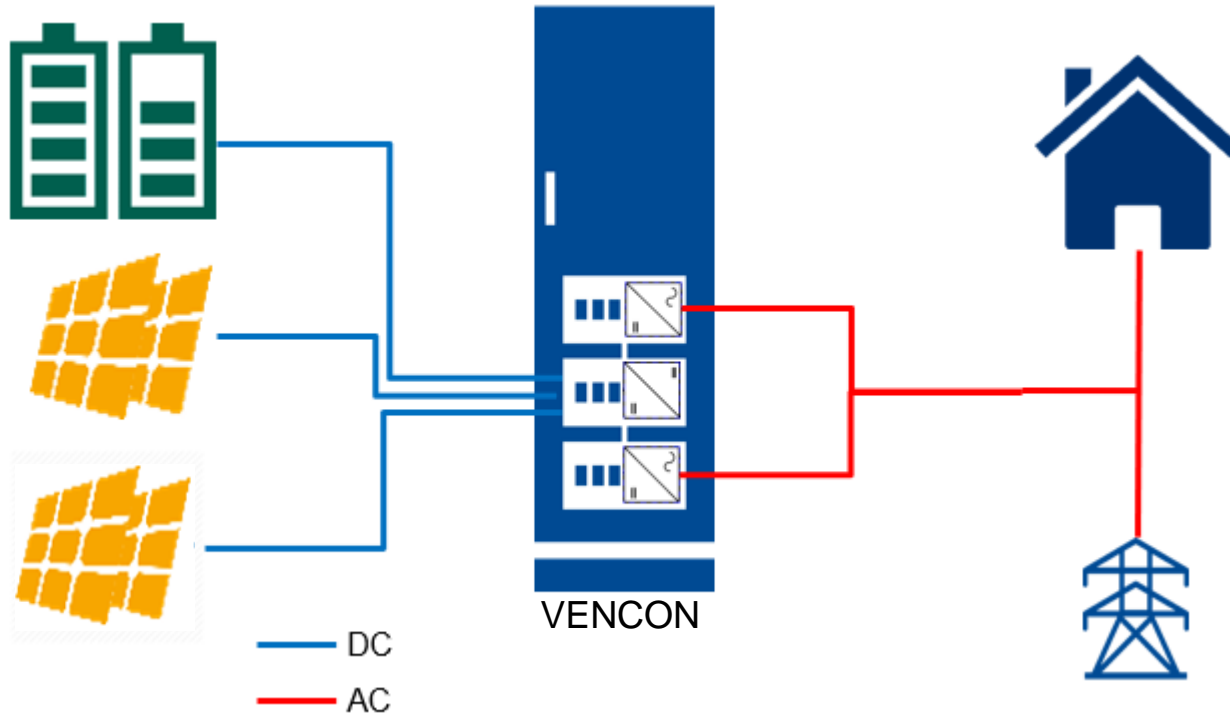
# Introduction to VENCON – VENSYS Hybrid Converter

VENCON for AC coupled solar plus energy storage systems (on-grid)



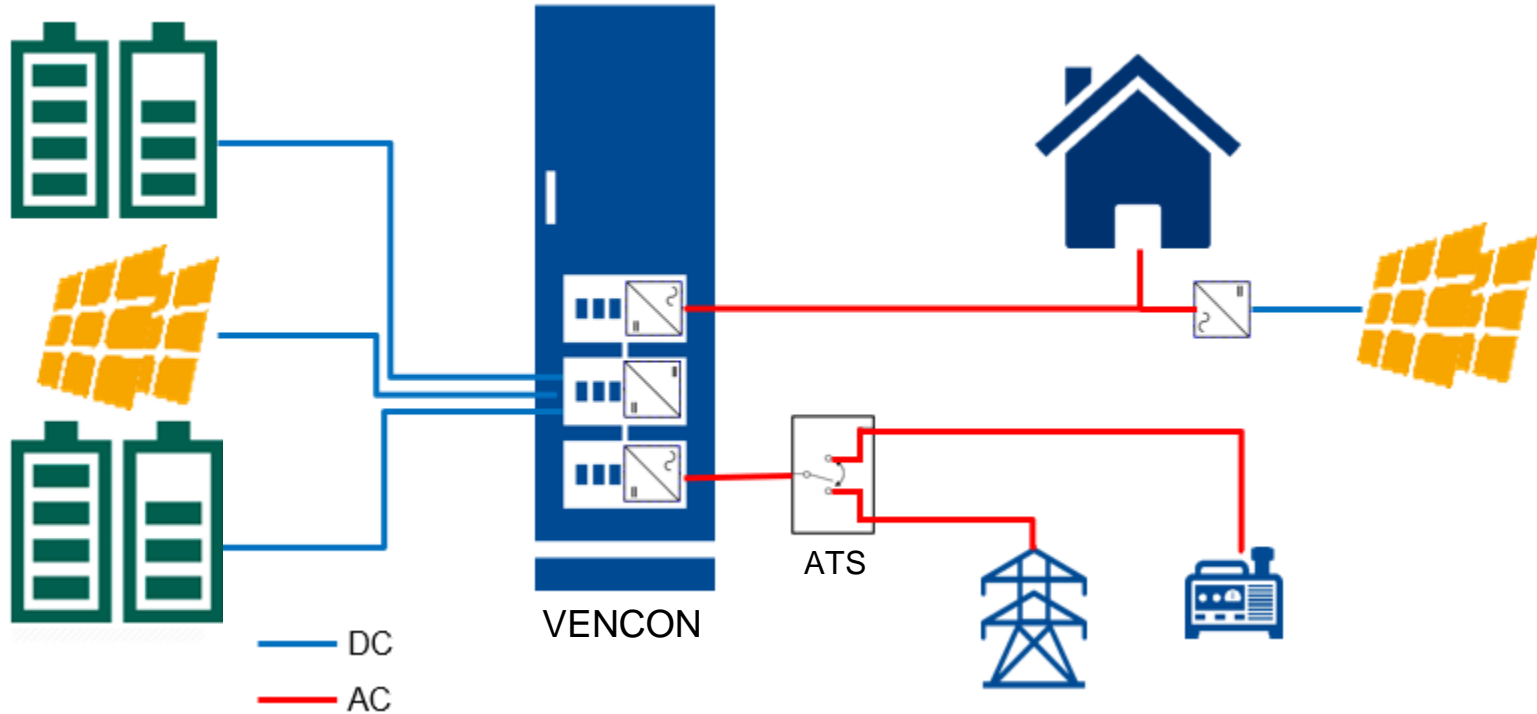
# Introduction to VENCON – VENSYS Hybrid Converter

VENCON for DC coupled solar plus energy storage systems (on-grid)



# Introduction to VENCON – VENSYS Hybrid Converter

VENCON for DC & AC coupled solar plus energy storage systems (off-grid/micro-grid)



## Flexible power conversion system solution for the energy & mobility transition



### 1 Photovoltaic systems

In these systems VENCON is used as a central decentral inverter concept.

### 2 Battery storage device

The battery storage device plays a vital part in the Smart Grid. On the one hand, it enables – in combination with VENCON – the formation of an island grid. On the other hand, it represents a buffer that temporarily stores excess energy from the renewable sources which can be retrieved again when needed.

### 3 Electrolyzer / power to gas

Production of green hydrogen (from RE electricity).

### 4 Consumers

Consumers are supplied by the low-voltage grid.

### 5+6 Wind and hydro power plants

VENCON can be used as a full-power converter for variable-speed machines. Depending on local conditions, energy can be generated using wind and hydro power plants.

### 7 DC charging stations

VENCON can supply the necessary energy for DC boost charging. In that case, a pre-charge storage device could serve as a possible energy source.

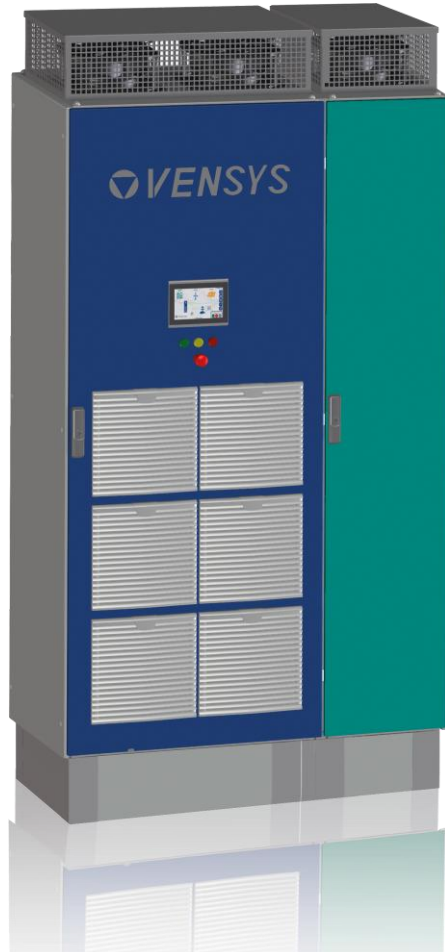
### 8 Backup generator

To enhance security of supply, a diesel generator can be integrated into the Smart Grid as a backup.

### V VENCON Hybrid

The VENCON Hybrid provides the option for peak load shaving and shifting. In a balanced combination of renewable energy sources and storage systems, a step towards the "green factory" [zero emission] with a maximum availability [back-up power] is also achievable.

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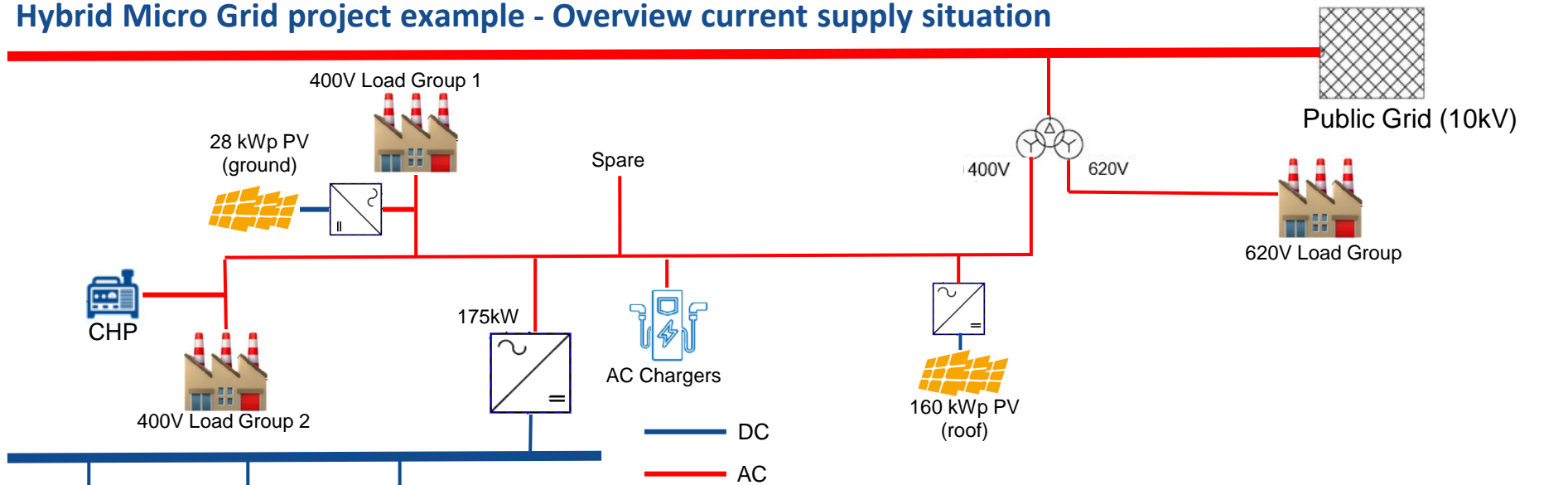
Hybrid Micro Grid project example



# Hybrid Micro Grid project example

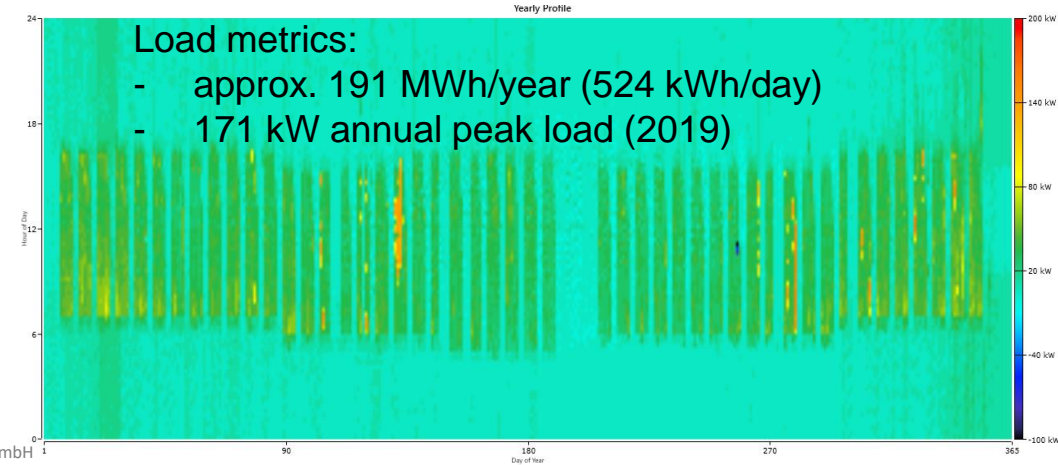


# Hybrid Micro Grid project example - Overview current supply situation

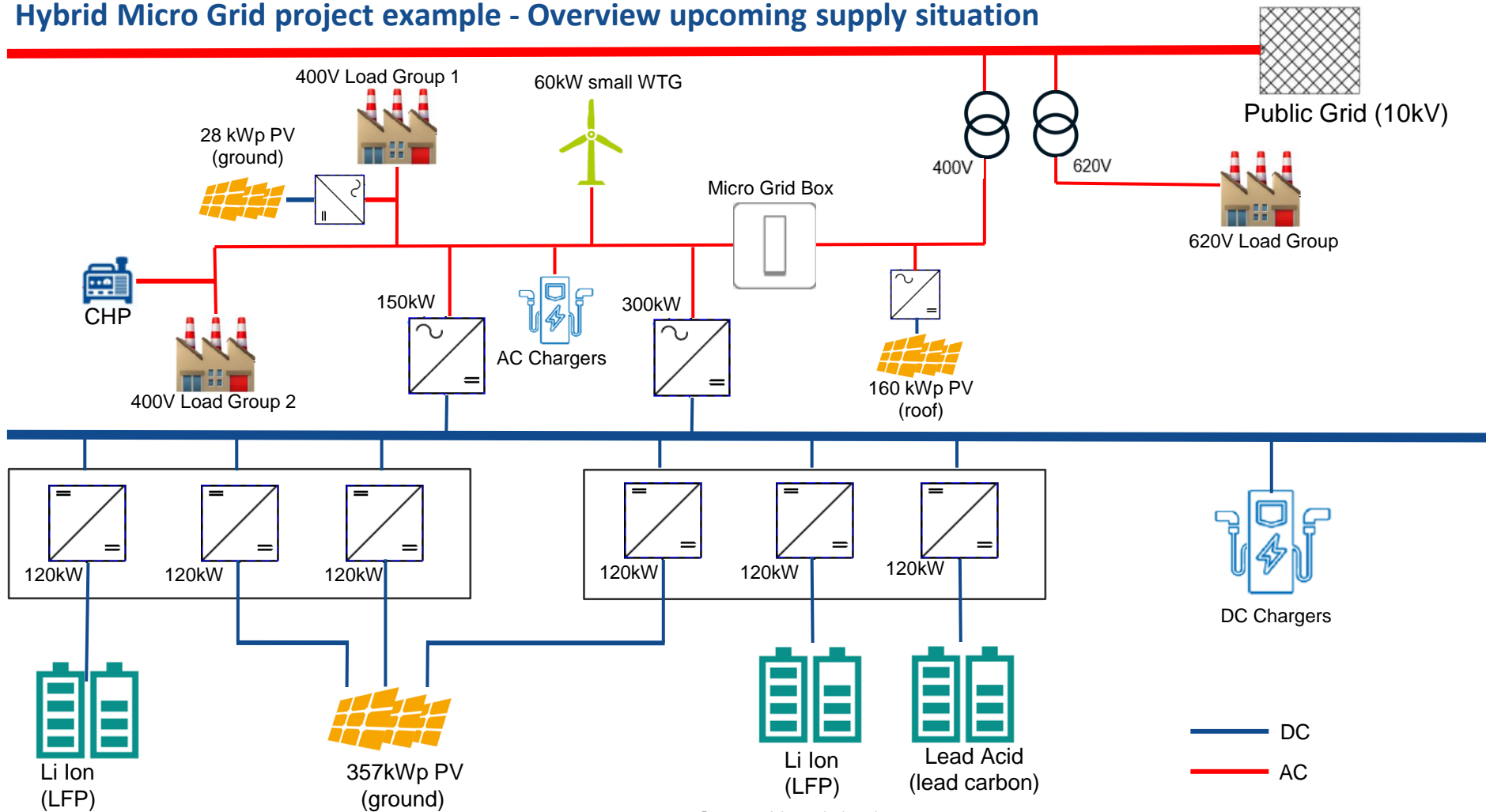


## Load metrics:

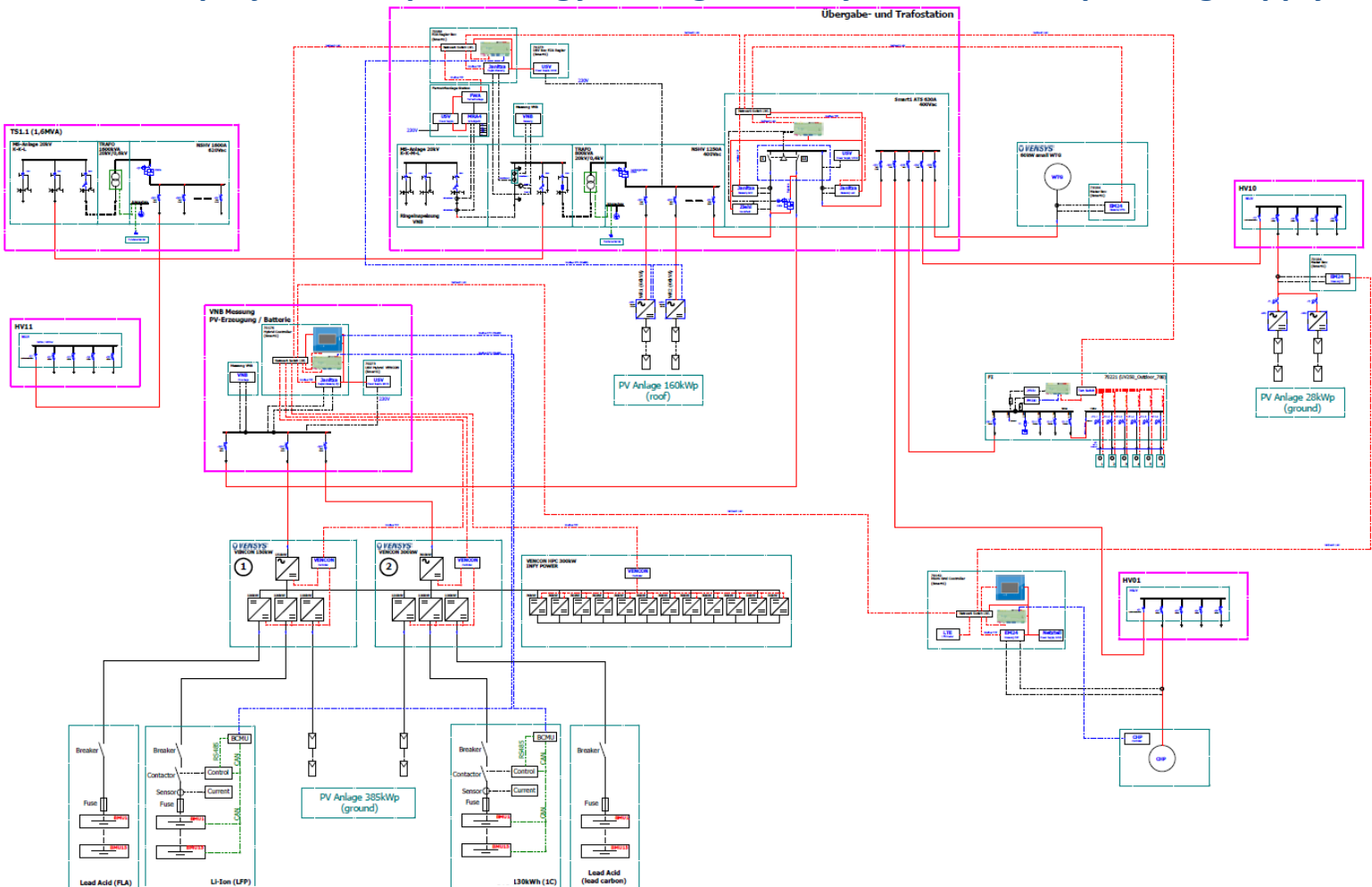
- approx. 191 MWh/year (524 kWh/day)
- 171 kW annual peak load (2019)



# Hybrid Micro Grid project example - Overview upcoming supply situation



# Hybrid Micro Grid project example - Energy Management System for the upcoming supply situation



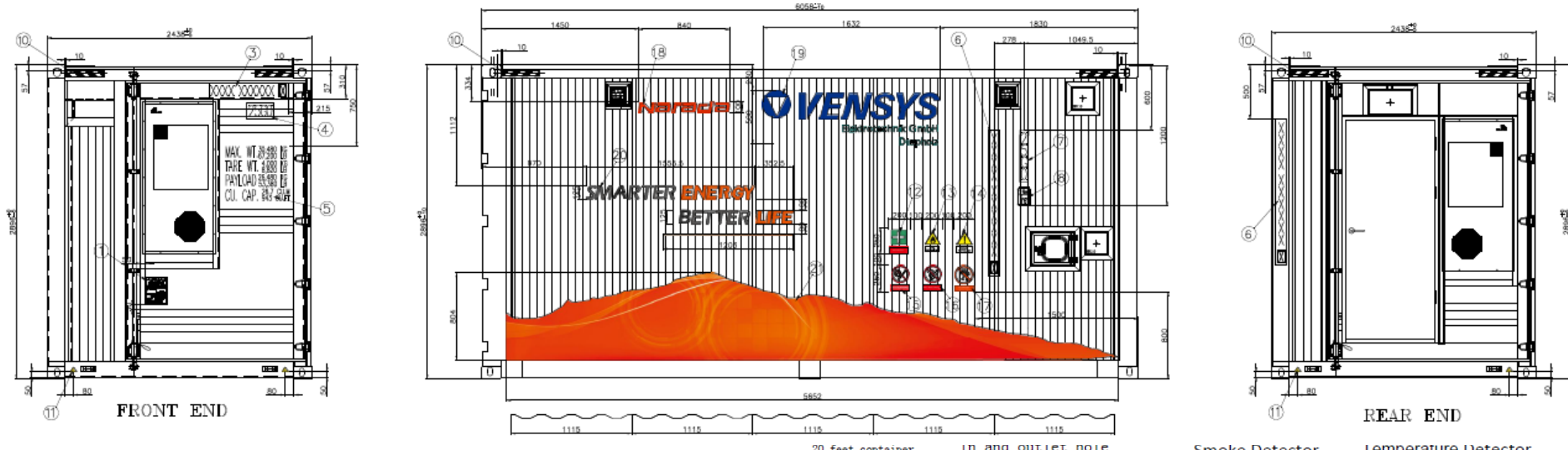
# Hybrid Micro Grid project example - Overview about the hybrid system components (1/4)



# Hybrid Micro Grid project example - Overview about the hybrid system components (2/4)

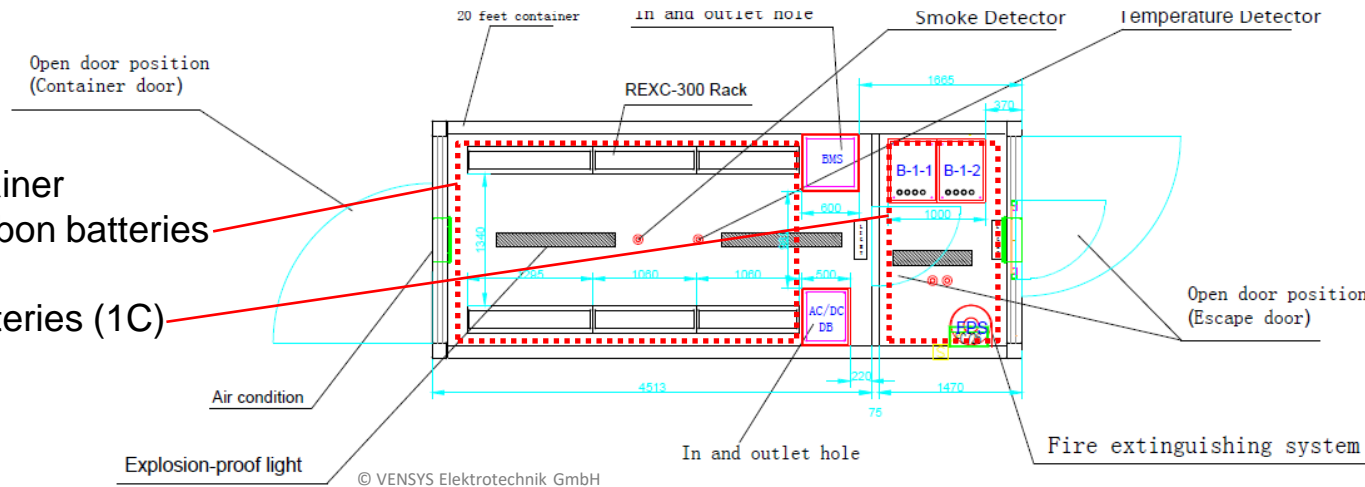


# Hybrid Micro Grid project example - Overview about the hybrid system components (3/4)



„Hybrid“ battery container

- 168 kWh lead carbon batteries
- 112 kWh LFP batteries (1C)



# Hybrid Micro Grid project example - Overview about the hybrid system components (4/4)



GENERAL	
Nominal power	kW 59,90
Cut-in Wind Speed	m/s 2,5
Rated Wind Speed	m/s 9
Cut-out Wind Speed	m/s 25
Total weight of WTG	kg 23.100
Tower weight (30 m)	kg 15.000
Nacelle weight (including rotor)	kg 8.100

GENERATOR	
Type	Direct Drive
Generator type	Synchronous radial flux permanent magnet generator - external use
Nominal power	kW 59,90
Voltage	300-410V AC
Cooling system	Conventional air cooling



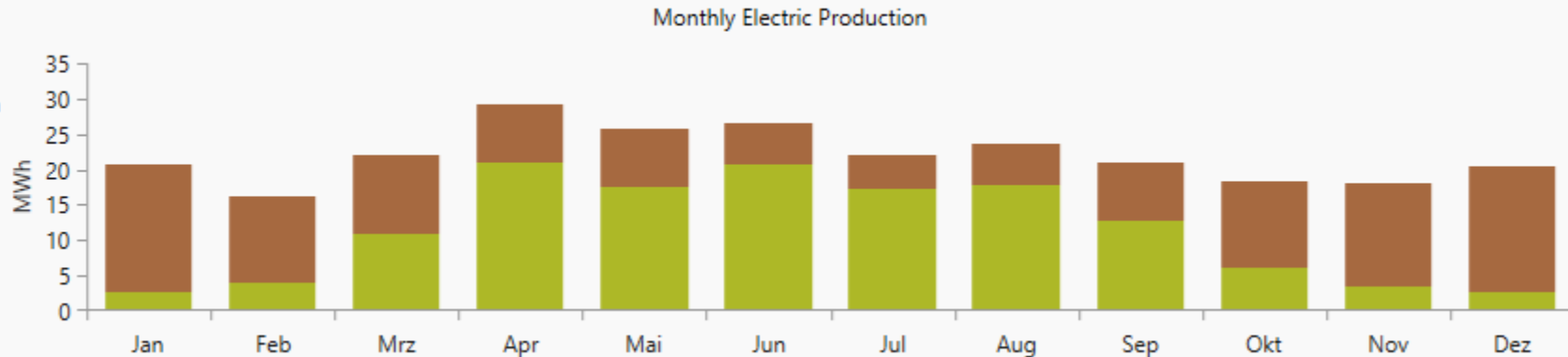
# Hybrid Micro Grid project example – Current renewable fraction

Production	kWh/yr	%
PV existing	136.172	51,7
Grid Purchases	127.283	48,3
Total	263.455	100

Consumption	kWh/yr	%
AC Primary Load	191.463	72,7
Grid Sales	71.992	27,3
Total	263.455	100

Quantity	kWh/yr	%
Excess Electricity	0	0

Quantity	Value	Units
Renewable Fraction	51,7	%
Max. Renew. Penetration	259.666	%



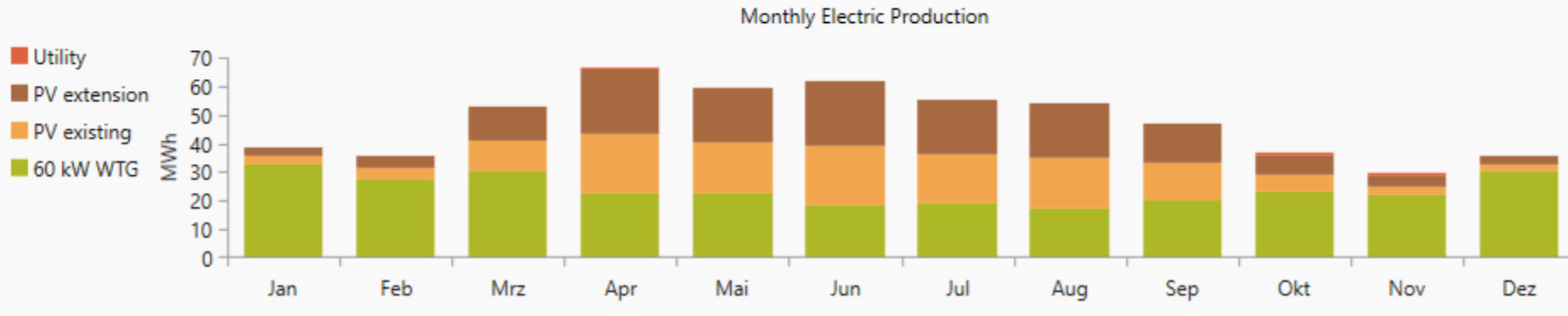
# Hybrid Micro Grid project example – Expected renewable fraction after upgrade

Production	kWh/yr	%
PV extension	147.213	25,7
PV existing	136.172	23,8
60kW WTG	285.935	49,9
Grid Purchases	3.307	0,577
Total	572.627	100

Consumption	kWh/yr	%
AC Primary Load	191.463	34,0
Grid Sales	371.907	66,0
Total	563.371	100

Quantity	kWh/yr	%
Excess Electricity	172	0,0301

Quantity	Value	Units
Renewable Fraction	99,4	%
Max. Renew. Penetration	638.648	%





**Thanks for your attention!**

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