

Making renewables the power supply of the future  
Closing the electricity access gap and securing grid resilience today



# About Autarsys GmbH

Autarsys energy storage systems (ESS) make renewable energy systems, like solar and wind farms, more efficient and cost-effective and stabilize power supplies.

The technology increases the share of renewable energy by up to 100%.

Customer types:

- Utility scale
- Rural electrification
- Commercial and Industrial (C & I)



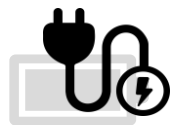
Autarsys won Alliance for Rural Electrification's 2018 award in the category of *Private Sector in Australia, Europe & North America*.

# Pain Points: Off-Grid Systems

## PAIN POINT

**no or unreliable  
power**

**environmental  
and  
noise pollution**



## SOLUTION

**EES: 24/7  
access to  
power**

**minimal  
reliance on  
fossil fuels**

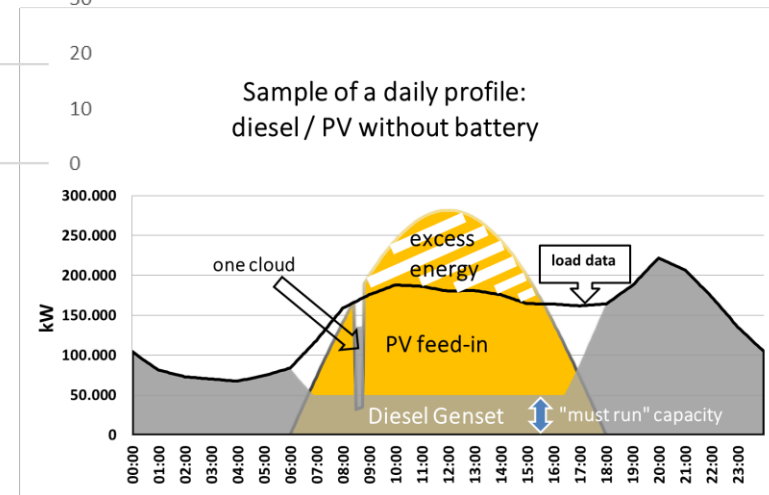
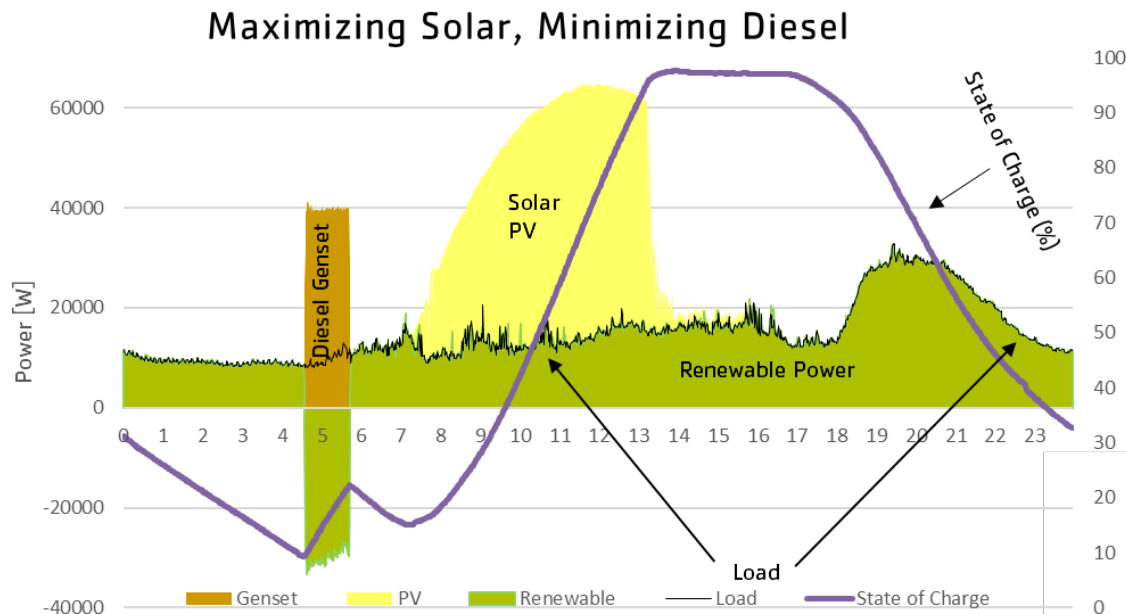
## HOW IT WORKS:

ESS transforms mini-grids into “smart” grids and reliable sources of power.

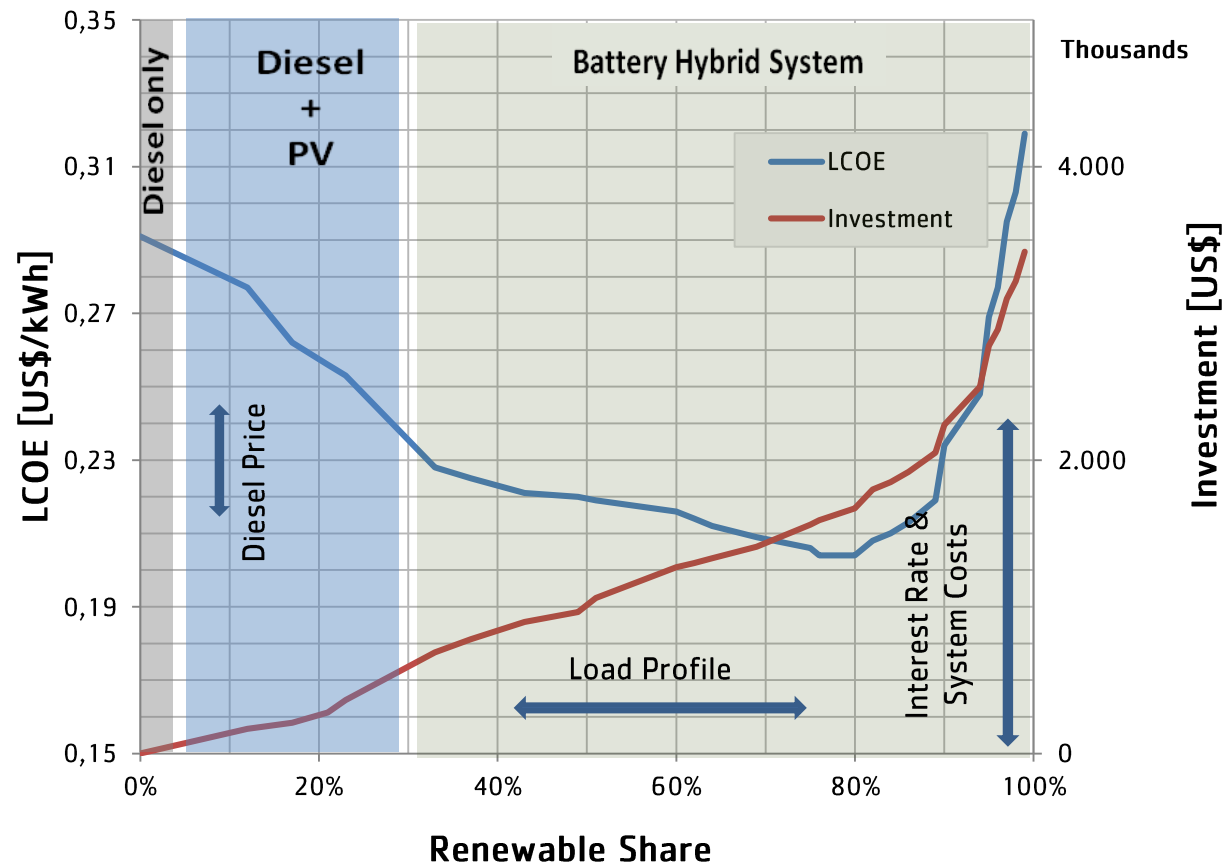
Provides consistent and affordable 3-phase power from renewable system.

Has the capacity to increase the share of renewable energy to 100%.




# Energy Management for Off-Grid Hybrid Systems:



# Energy Management for Off-Grid Hybrid Systems: Reducing Levelized Costs of Electricity (LCOE)



# Pain Points: On-Grid Systems

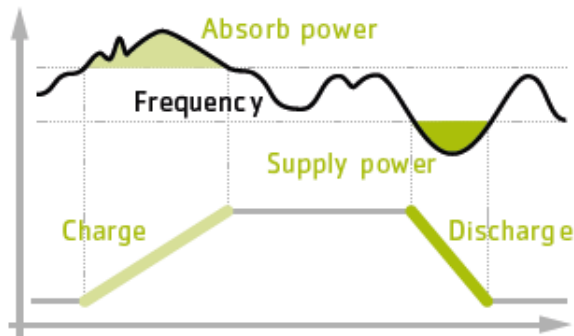
PAIN POINT		SOLUTION	HOW IT WORKS:
erratic voltage and frequency	  	<b>"Renewable Support Mode"</b>	Provides PV smoothing and ramping or peak shaving to stabilize the renewable system.
unstable grids		<b>"Grid Support Mode"</b>	Corrects weak grids with insufficient power supplies that experience load dropping and brownouts
untapped energy assets		<b>"Market Mode"</b>	Engages in energy arbitrage trading with national grid owners, returning profits to local grid operators from the sale of generated renewable energy.
energy dependence		<b>"Island Mode"</b>	Ensures that in the event of power disruptions within the national grid, the local system can operate independently.

# Stabilizing Grids & Reducing CO<sub>2</sub> Emissions

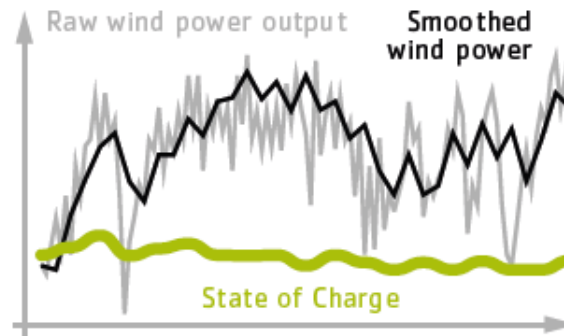
Frequency Regulation • Renewable Ramp Rate Control • Energy Arbitrage

Utility scale renewable plants expose grids to highly fluctuating currents that limit their ability to incorporate renewable resources.

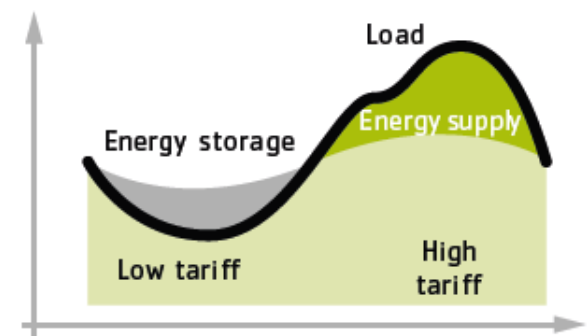
That's why they need energy management systems (EMS) like those developed by Autarsys.



Frequency Regulation



Solar/Wind Ramp Rate Control



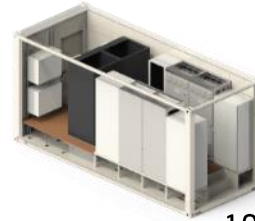
Energy Arbitrage



# Autarsys ESS: 3 standard sizes with additional modularity



30 – 90 kVA



100 – 800 kVA



3325 kVA

Nominal AC Power

Energy Capacity

Dimensions (l × b × h)

Output Current

Output Voltage / Frequency

System Efficiency

Ambient Temperature

Guarantee\* / Lifetime\*

ESS Features and Capabilities

33 – 274 kWh

2.44 × 2.20 × 2.26 m<sup>3</sup>

43.5 – 130.5 A

3 Ø 230/400 V @ 50/60 Hz

96%

10 to 50 °C

10 years / 20 years

65 – 1092 kWh

6.06 × 2.44 × 2.90  
m<sup>3</sup>

175 – 525 A

max\* 3652 kWh

12.12 × 2.44 × 2.90  
m<sup>3</sup>

max. 4000 A

On-Grid & Off-Grid Ready / Online UPS / SWERnet Integration / Fuel Save / Diesel Generator Control / Energy Management / Dynamic Grid Support / Reactive Power Compensation / Blackstart

- The guarantee and lifetimes mentioned are under specific standard conditions of operation of the ESS. Actual product specifications and layout may vary depending upon the application.

\* Autarsys ESS can be combined to scale and form bigger systems.



# Autarsys Batteries:

## Lithium-Ion Advantage

	Lead acid	Lithium-Ion	Advantage of Lithium-Ion	
<b>Round trip efficiency</b>	70-85%	85-95%	✓	Requires smaller PV plant, therefore lower investment costs
<b>Energy Density (Wh/Kg)</b>	25-50	75-200	✓	Requires smaller battery
<b>Cycles at Depth of Discharge</b>	500 @ 80%, 2000 @ 50%	1500-4500 @ 80%	✓	Longer lifecycle and fewer necessary replacements
<b>Investment Costs (per kWh)</b>	80-200 USD	200-800 USD	✗	While nominal kWh capacity values prefer LA, usable capacity costs should be taken into consideration
<b>Temperature range (°C)</b>	-5 to 40	Autarsys ensures $23 \pm 5^{\circ}\text{C}$ to fulfill warranty	✓	Li-ion is stable over a wider temperature range from -25 - 50°C



## Reliable Components:

# Warranty and Performance Guarantees

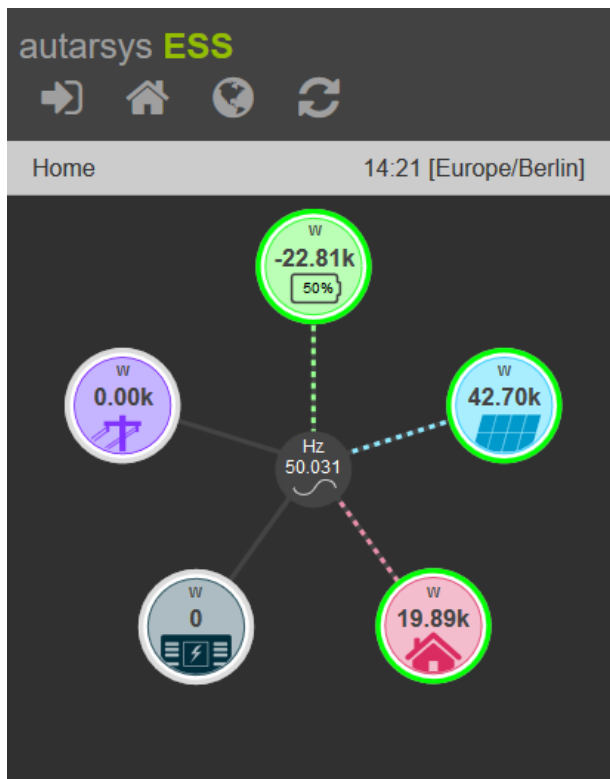
years	<i>Warranty</i>	<i>Performance Guarantee</i>
<b>PV System</b>	10 years	20 years
<b>Batteries</b> (all components)	2 years	10 years

Batteries performance is measured at

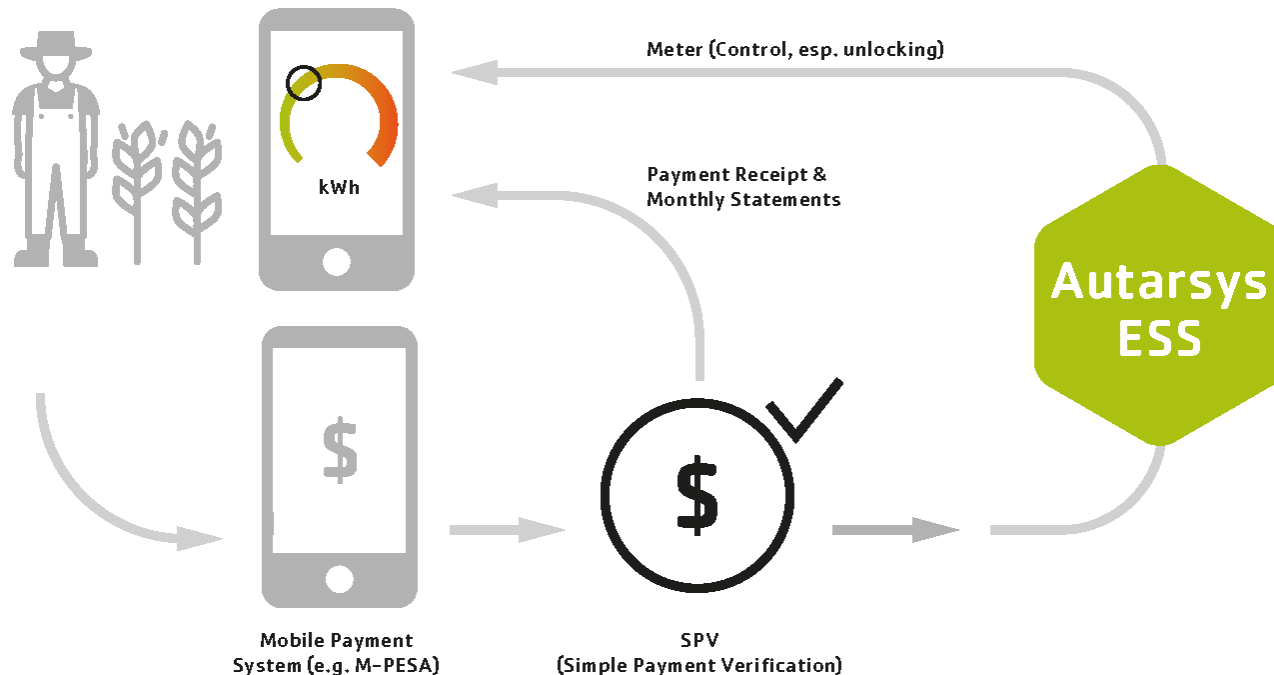
- 1 cycle per day
- Ambient temperature in the battery compartment  $23 \pm 5^{\circ}\text{C}$
- max. current below XX A / rack, charge and discharge

# Web-Based Monitoring: User-friend control center

- **Responsive web interface.** Runs on any device with a modern browser.
- **Alarm chain.** Notifies operators of necessary measures needed to restore system to stability.
- **Local data storage.** Allows export and download of relevant data
- **Remote access via VPN** (virtual private network)



# Featured Payment System: Transparent and Accessible Tariff Collection



# Qi Palawan, Philippines

Off-grid holiday resort

Autarsys Mini ESS: 30 kW / 124 kWh scalable up to 248 kWh





# New Ibajay, Philippines

Off-grid village

Autarsys Mini ESS: 60 kW / 248 kWh



# Nicosia, Cyprus

Off-grid research with University of Cyprus  
Autarsys Mini ESS: 30 kW / 83 kWh





# Our Project: Mayo-Baléo, Cameroon

Electrifying an off-grid border town

Autarsys Medium ESS: 200 kW / 150 kWh



# Lakeland, Australia

Grid-connected, utility scale storage

Autarsys Large ESS: 1.4 MW / 5.3 MWh



# Solutions : From Ideation to Development



## Analysis & Engineering

Assess load profiles and forecast energy demand

Evaluation of grids and renewable energy sources

Customize energy storage systems (ESS)



## Installation & Commissioning

Provide onsite O&M training for technical personnel

Develop web interfaces that facilitate energy control

Commission for operational compliance and quality assurance



## Operation & Maintenance

Ensure remote monitoring of system performance

Provide online support and troubleshooting

Manage hardware and software throughout product lifecycle

# What we offer: Our Business Model



**EPC. Engineering, Procurement and Construction**



**Leasing Models. Facilitate acquisition of systems**



**PPA. Power Purchase Agreements**



**Thank you!**  
**Let's work together.**

## **Autarsys GmbH**

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