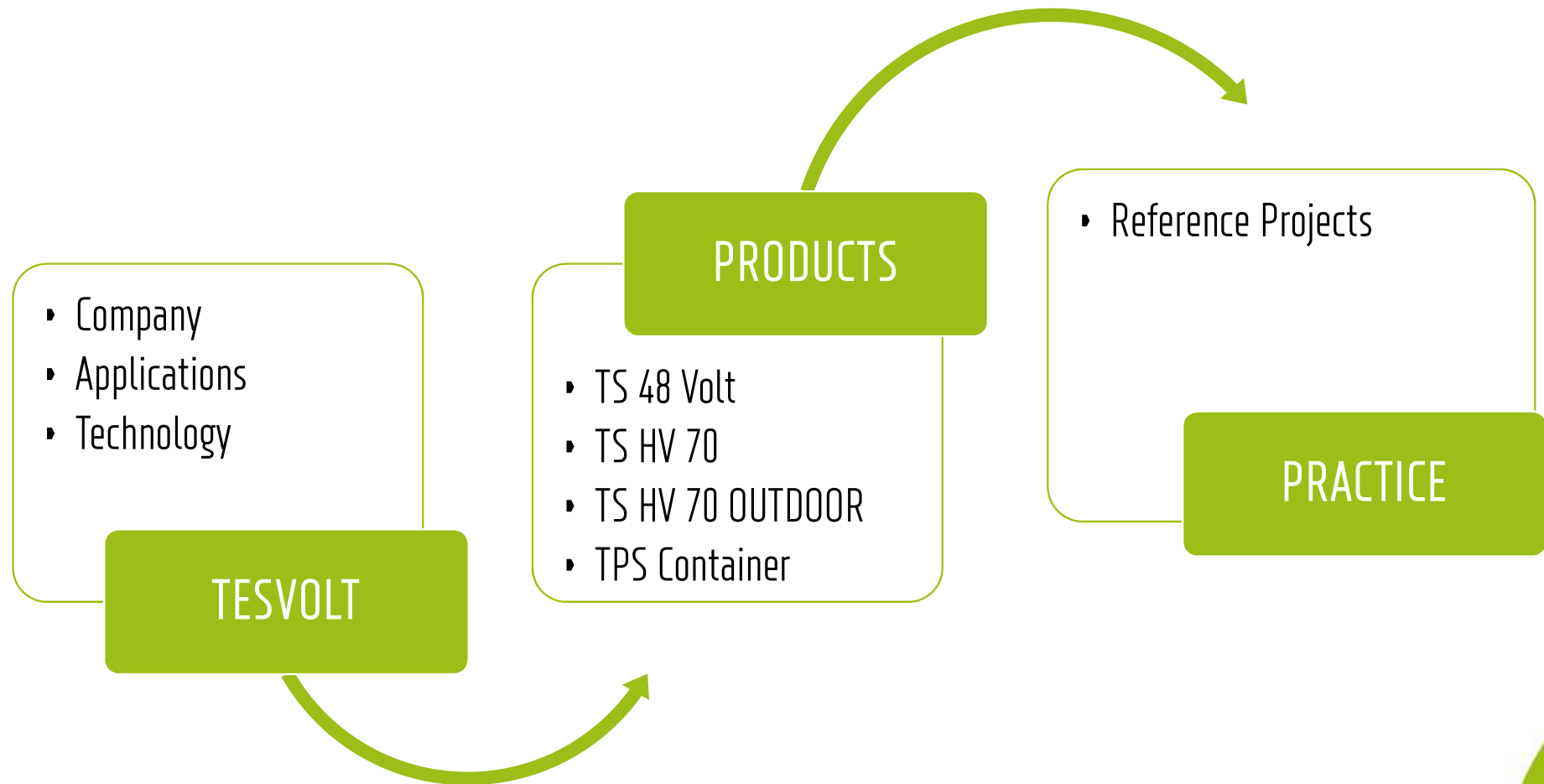


# WE HAVE A THEN FOR ANY WHEN

Sven Huntemann – Area Manager

Barcelona, 05.11.2019

# AGENDA



# TESVOLT GIGAWATT FACTORY

STORAGE SYSTEMS - DESIGNED AND PRODUCED IN LUTHERSTADT WITTENBERG. SHIPPED WORLDWIDE.



- New headquarter & gigawatt plant
- Carbon-neutral production using PV, TESSVOLT storage systems & innovative heating pump technology
- Annual production output of up to 1-gigawatt hour (GWh)
- Final expansion phase leading to 20,000 sqm of usable space
- Ultra-modern training academy
- R&D headquarter
- Set to open in the second half of 2019





## THE FOUNDERS

TECHNOLOGY COMPANY SINCE 2014

### DANIEL HANNEMANN, CEO & FOUNDER

Responsible for strategic corporate development and sales

### SIMON SCHANDERT, CTO & FOUNDER

Responsible for production, R&D and technical support

### NAMED AFTER THE INVENTORS

Nikola Tesla & Alessandro Volta



## OUR OFFICIAL PARTNERS

Battery manufacturer:

**SAMSUNG SDI**

**Lithium NMC technology**

Inverter Manufacturer:

**SMA SOLAR TECHNOLOGY AG**

**(Sunny Island, Sunny Tripower Storage, Sunny Central Storage)**

Financial Participation:

**State of Saxony-Anhalt**



**SACHSEN-ANHALT**

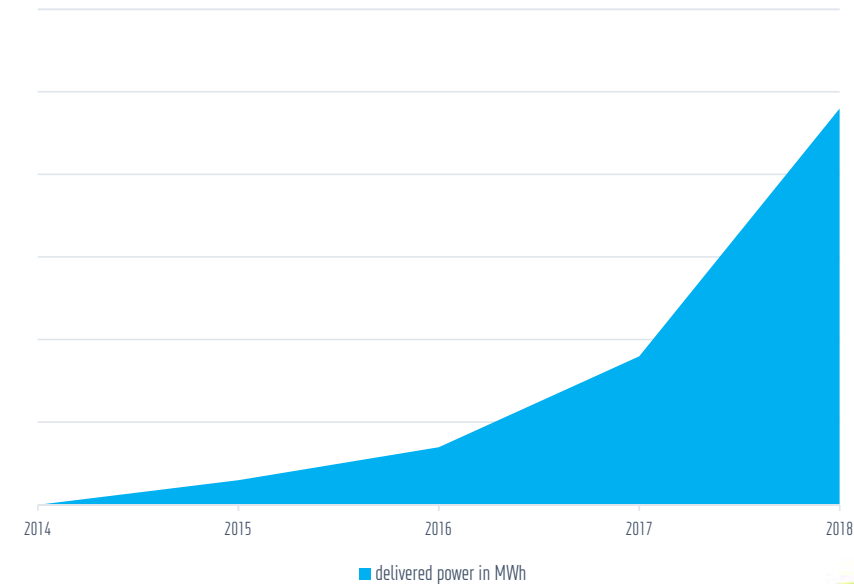


EUROPÄISCHE UNION

**EFRE**

Europäischer Fonds für  
regionale Entwicklung

## GROWTH



# APPLICATIONS

## APPLICATIONS

### INCREASED SELF-CONSUMPTION

Consume more of your self-generated electricity

### PEAK LOAD SHAVING

Cut your consumption peaks and save money due to lower power consumption

### BACKUP POWER

In case of a power outage, your storage system takes over the electricity supply within a split of a second

### DIESEL-HYBRID OPTIMIZATION

Save fuel and achieve better system utilization.

### OFF-GRID ELECTRICITY SUPPLY

Create your own electricity grid, e.g. with a photovoltaic system

### FREQUENCY RESERVE (PRL)

Contribute to main grid stabilization and charge the battery when there is too much energy in the grid or discharge your battery when there is too little energy in the grid.

### CHARGING STATION INFRASTRUCTURE

Connection of electric charging stations without removing or expanding their mains connection and cut off any resulting consumption peaks.

## Constant Consumption

Cold stores  
Parking houses  
Livestock breeders  
Sewage treatment plants  
IT infrastructure

## Morning & Night Consumption

Butchers  
Bakeries

## Morning & Evening Consumption

Dairy Farms

## Day & Evening Consumption

Hotels & Pensions  
Restaurants  
Gas stations  
Theaters / Cinemas / Opera Houses  
Entertainment / Sports Facilities  
Lighting-oriented power consumption

## Day Consumption

Educational Facilities & Canteens  
Administrations & Authorities  
Banks / Offices / Service Providers  
Production & Manufacturing:

- Construction & Workshops
- Car dealerships
- Supermarkets

## WHAT MAKES TESVOLT UNIQUE

- Lifespan up to 30 years
- Depth of discharge (DoD) 100%
- Number of full cycles<sup>1</sup> 8,000
- Guaranteed cycles<sup>2</sup> 6,500
- Stand-by consumption 3 – 5 Watt
- C-Rate 1 C (4.0 C max. 20 Sek.)
- Efficiency (Battery) > 98%

- Very safe cell technology
- Battery monitoring at cell level
- Active balancing at cabinet, module & cell level
- Expandable capacity - even years later
- Made in Germany

- Low LCOS: 9 Eurocents / kWh
- Very efficient & safe storage systems on the market

# PRODUCT PORTFOLIO

## Cabinet systems

TS 48 V

TS HV 70

TS HV 70 OUTDOOR



10 kWh  
–  
3,000 kWh

67 kWh  
–  
6,080 kWh



67 kWh  
–  
307 kWh

## Container system

TPS flex, TPS 1.1, TPS 2.0



0.2 MWh  
–  
100 MWh

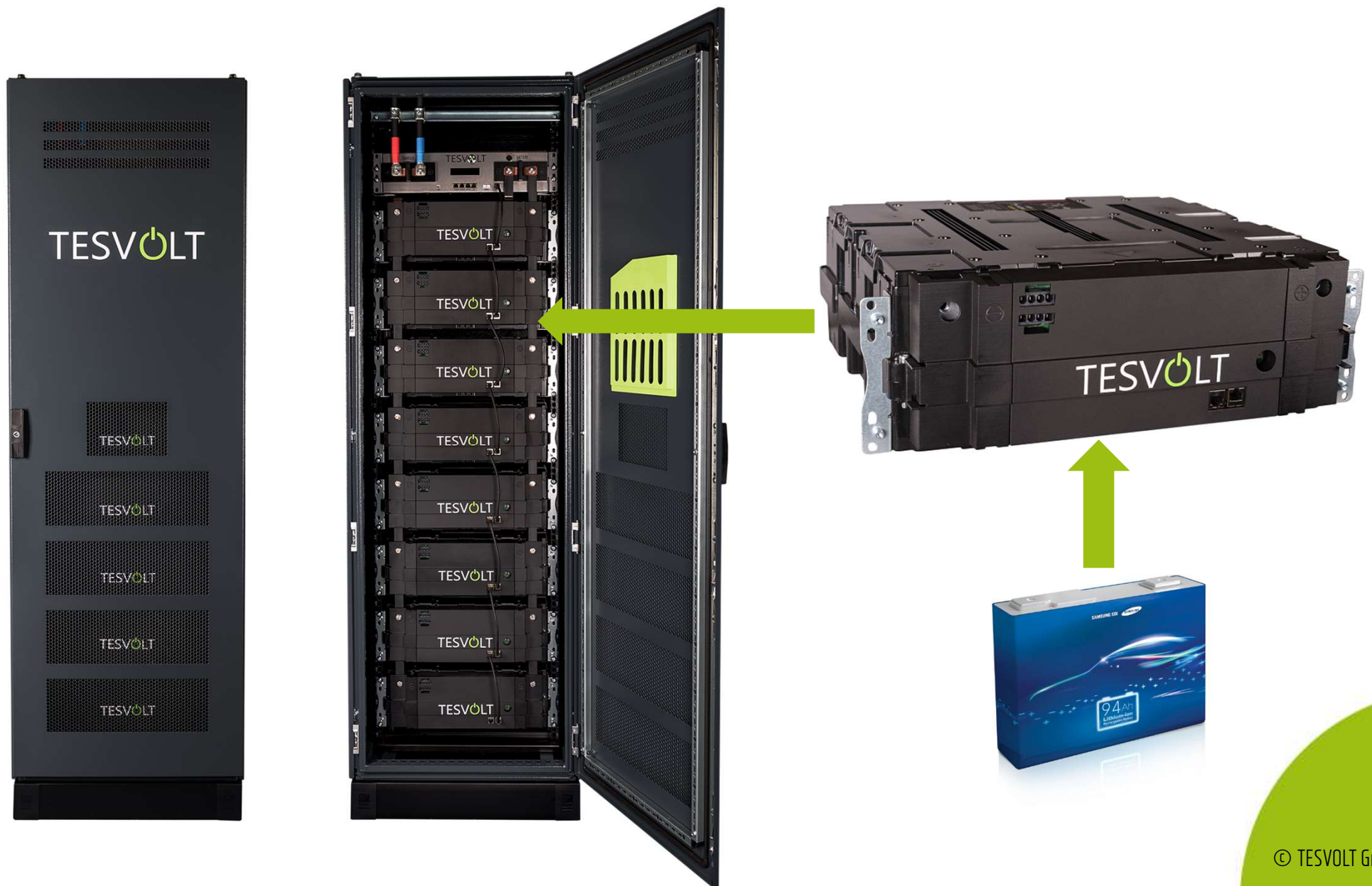
10 kWh – 100 MWh

The smarter E Award: Off-Grid Avocado Farm with TS 48 V in Australia, project of our partner Unlimited Energy Australia

ees Award: TS HV battery

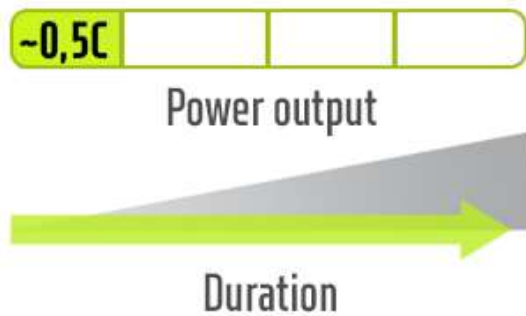
© TESVOLT GmbH



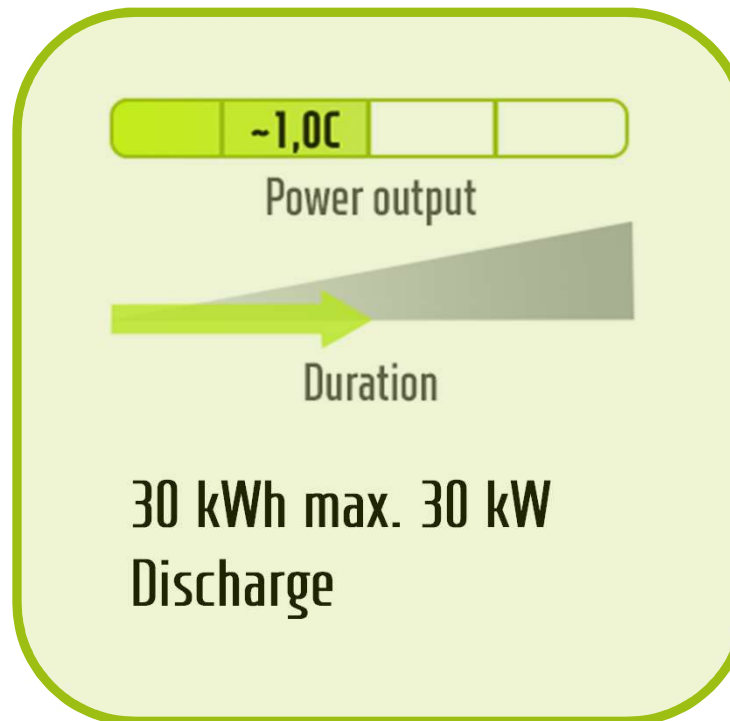


## Useful Information

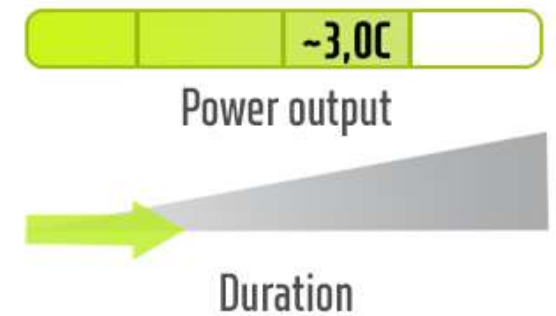
**1C-RATE means:** kW = kWh (loading and unloading of the lithium battery within one hour)



30 kWh max. 15 kW  
Discharge



30 kWh max. 30 kW  
Discharge



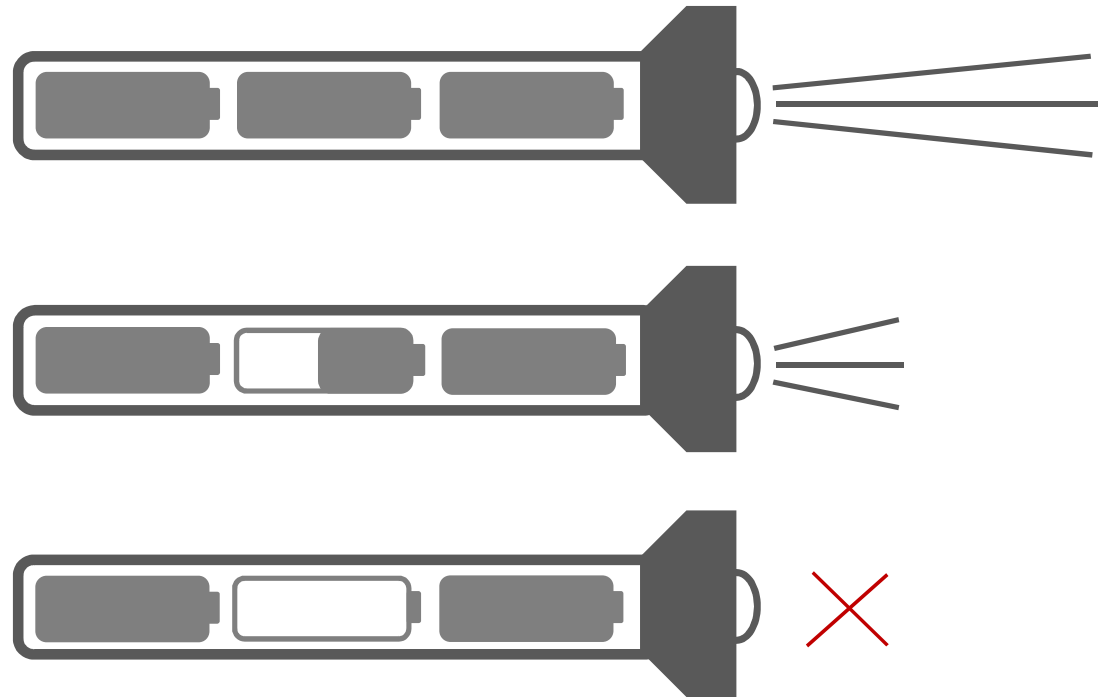
30 kWh max. 90 kW  
Discharge

**BATTERY MODULE**

**+**

**ACTIVE BATTERY OPTIMIZER (ABO)**

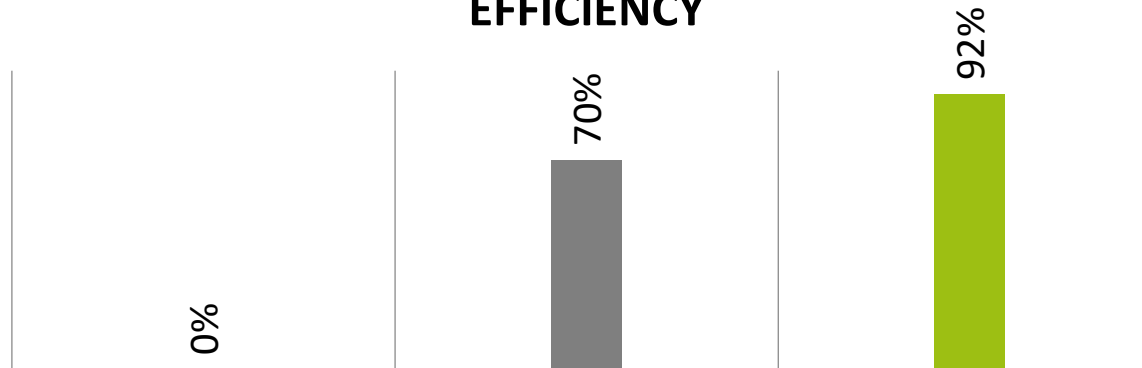
# THE FLASHLIGHT EFFECT



The weakest cell determines the performance of the system

# BALANCING METHODS

## EFFICIENCY

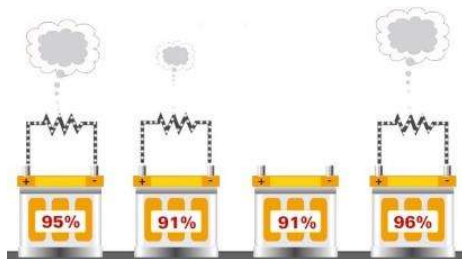


INFO: 196 cells in series in the TS HV 70

PASSIVE

UNI DIRECTIONAL

ACTIVE BATTERY OPTIMIZER



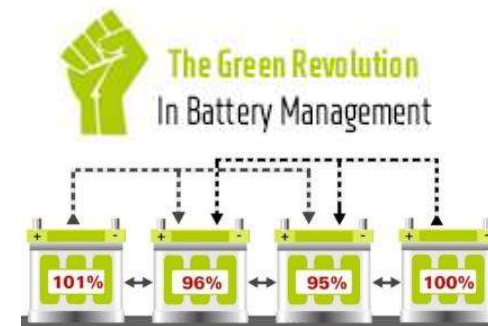
“Burning” excess energy via resistors

0.05 A balancing current



Transfer of energy from cell to cell

3 A balancing current

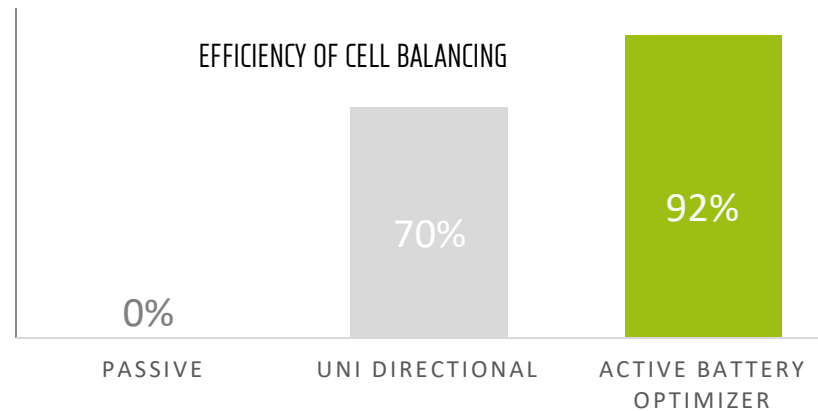


Targeted distribution of energy to individual cells

5 A balancing current

# BATTERY MANAGEMENT HIGHLIGHTS

## ACTIVE BATTERY OPTIMIZER



## FAST BALANCING

PASSIVE BALANCING  
0.05 A balancing current

100 x faster

ACTIVE BATTERY OPTIMIZER  
5 A balancing current

## SELF-CONSUMPTION

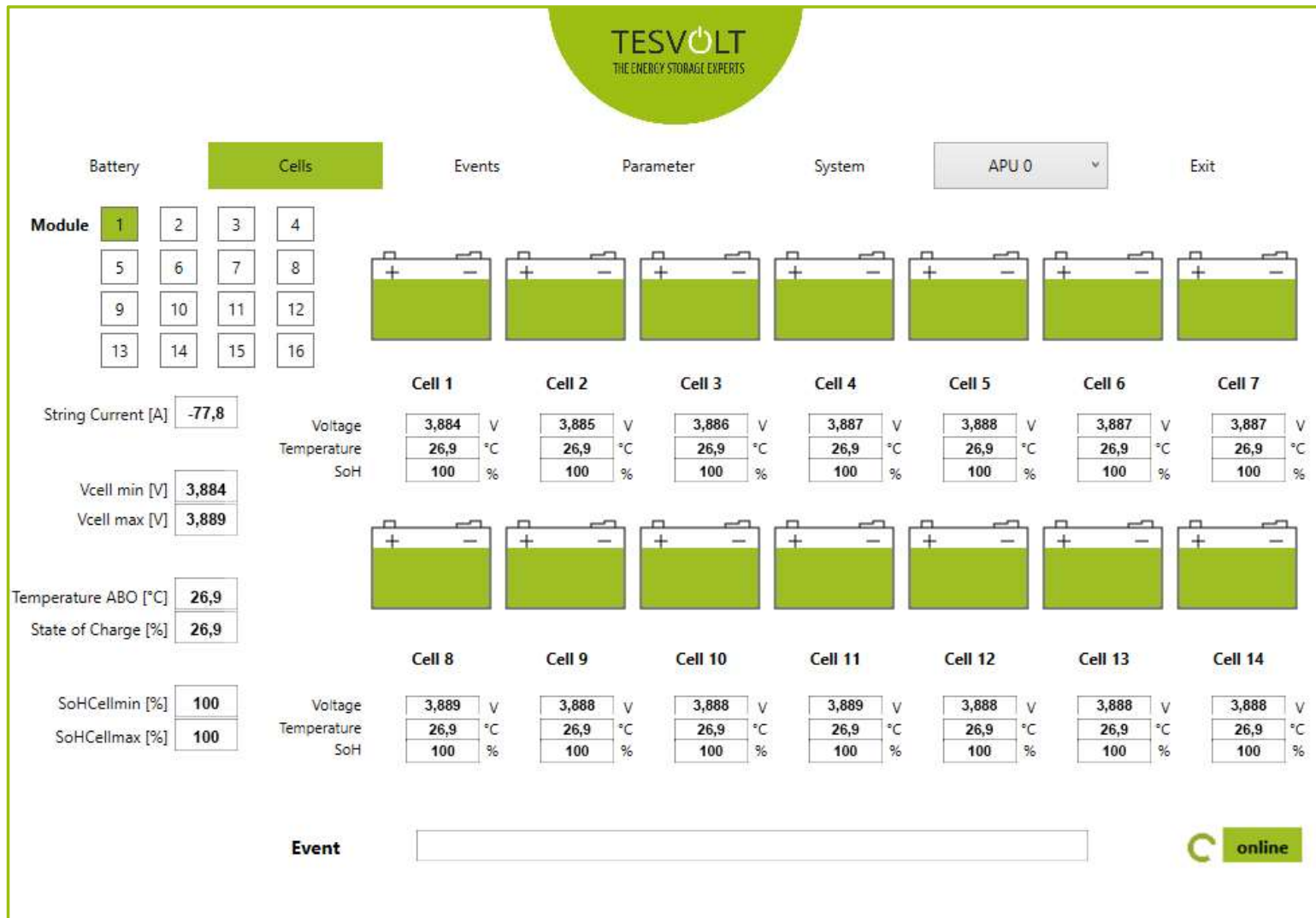
### SELF-CONSUMPTION



Difference = about 35 Wh, which is:  
840 Wh / Day  
306 kWh / Year  
6.1 MWh / 20 Years



# TESVOLT BATMON



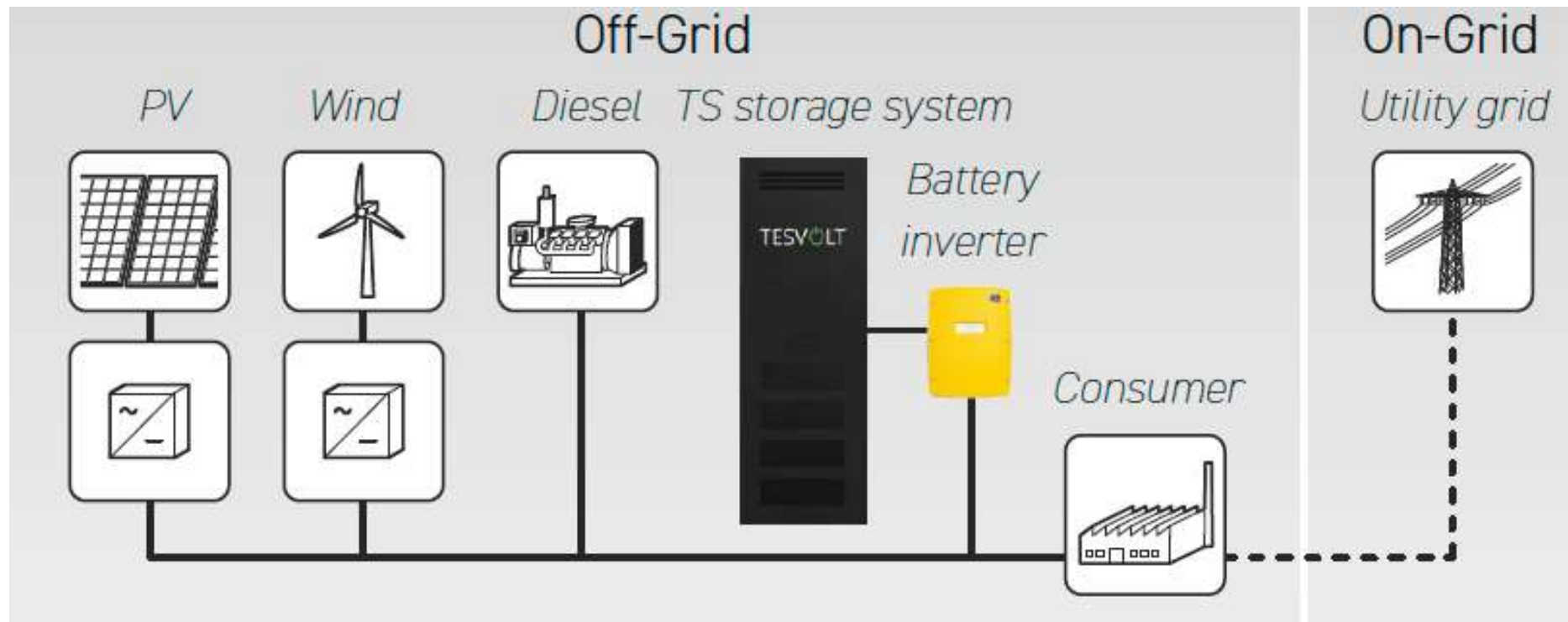
## SOLUTIONS AS REQUIRED

	Peak Load Shaving	Backup Power	Increased Self-Consumption	Diesel Hybrid Optimization	Off-Grid Electricity Supply	Frequency control power (PRL)
TS 48 V		✓	✓	✓	✓	
TS HV 70	✓		✓	✓		✓
TS HV 70 Outdoor	✓		✓	✓		✓
TPS flex, TPS 1.1, TPS 2.0	✓	✓	✓	✓	✓	✓



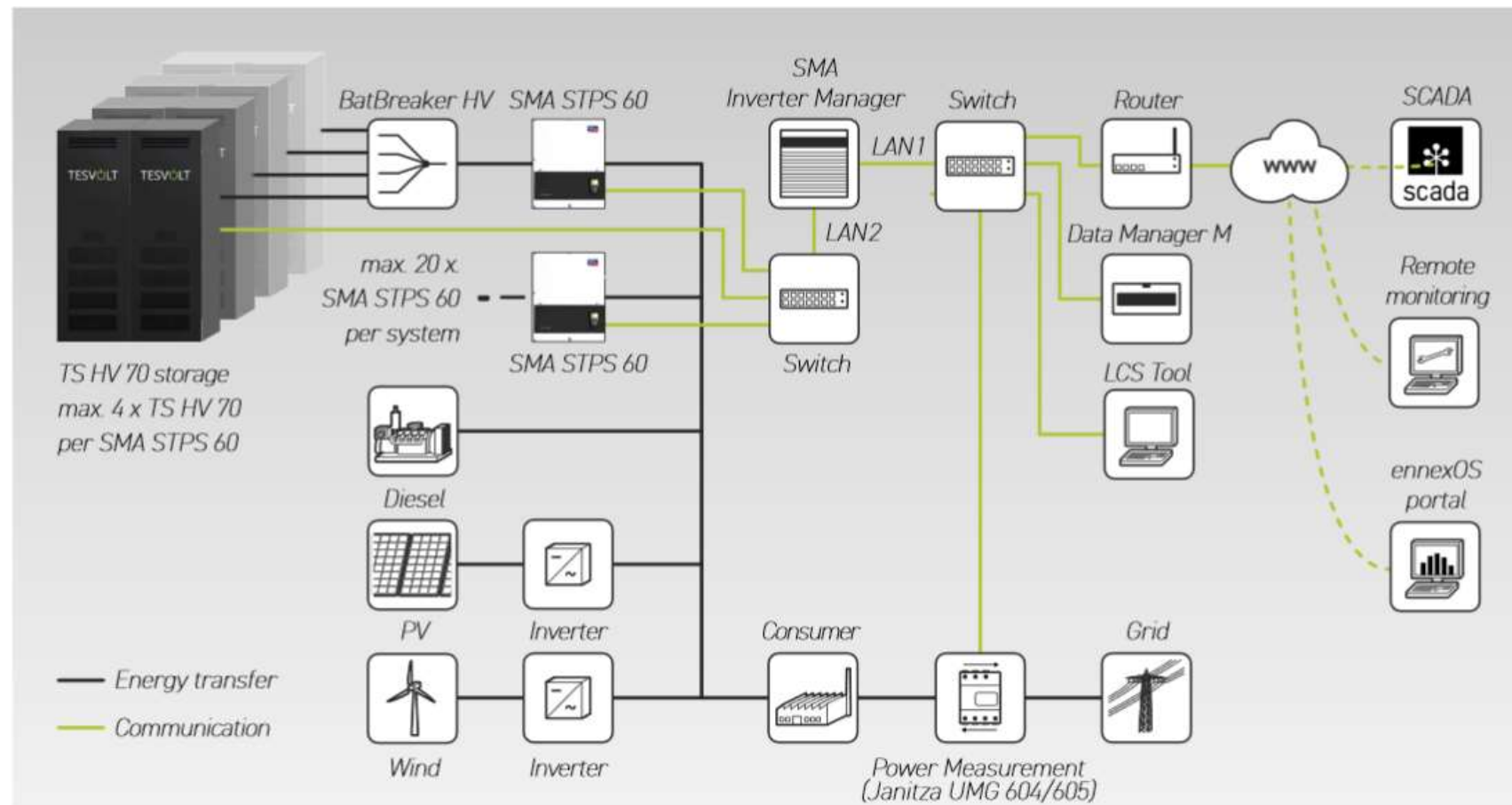
## CONNECTION WITH SMA SUNNY ISLAND

### STANDARD SYSTEM DESIGN



# CONNECTION WITH SMA SUNNY TRIPOWER STORAGE 60 (SMA STPS 60)

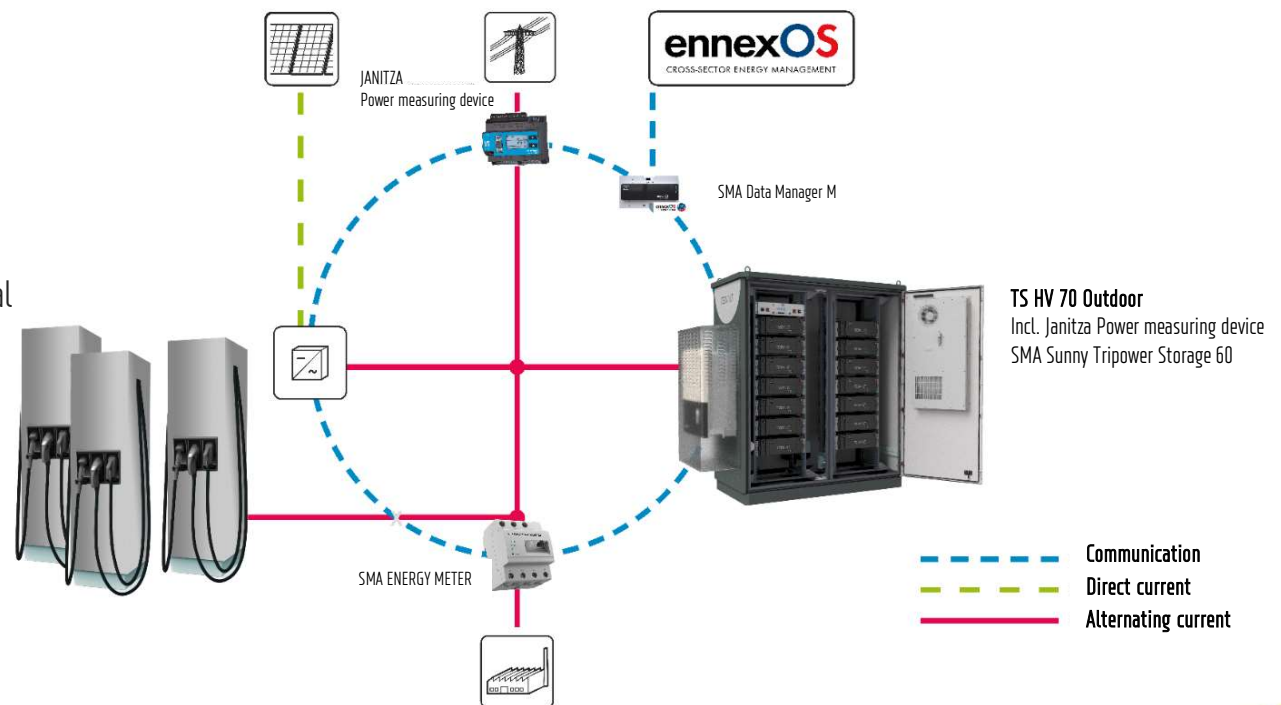
## STANDARD SYSTEM DESIGN



# THE TESVOLT / SMA Solution for EV Charging Station

## PERFORMANCE CHARACTERISTICS

- Up to 40% energy cost savings through peak load management
- Consumption-dependent control of charging stations and other loads
- Optimization of self-consumption
- Monitoring of all energy flows via the Sunny Portal in combination with SMA Energy Meter
- High savings of investment costs as a result of avoided grid extension
- Integration of all charging station manufacturers in combination with SMA Energy Meter



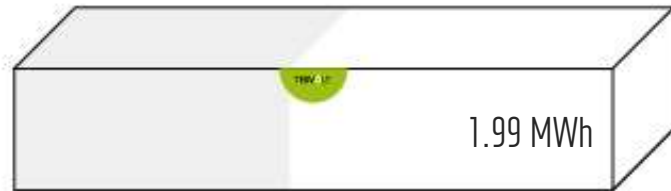
# TPS 2.0

## KEY FACTS

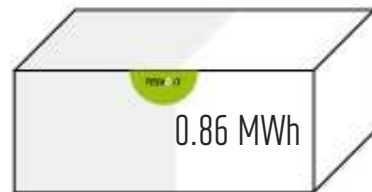
### TPS 1.0



45 ft.

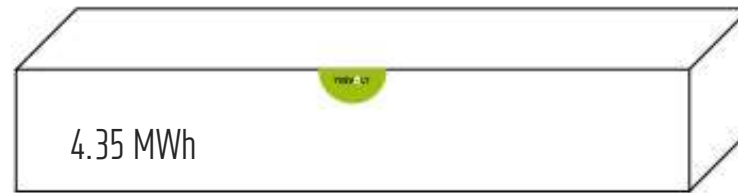


40 ft.



20 ft.

### TPS 2.0



Compared to the TPS 1.0, the TPS 2.0 achieves the same capacity with only half the volume in the container.



# REFERENCE PROJECTS

## On-Grid



# Shipping Company, Germany

48 kWh / 18 kW

PV charging current for electric fork-lift trucks

Partner: Solar-E-Technik Hamm







# Cold Storage, Germany

120 kWh / 36 kW

Protection of the generator +emergency power





**EXPO 2017**  
• Future Energy •  
Astana Kazakhstan

# Expo 2017 Astana, Kazakhstan

0.25 MWh / 0.25 MW  
Increased Self-Consumption

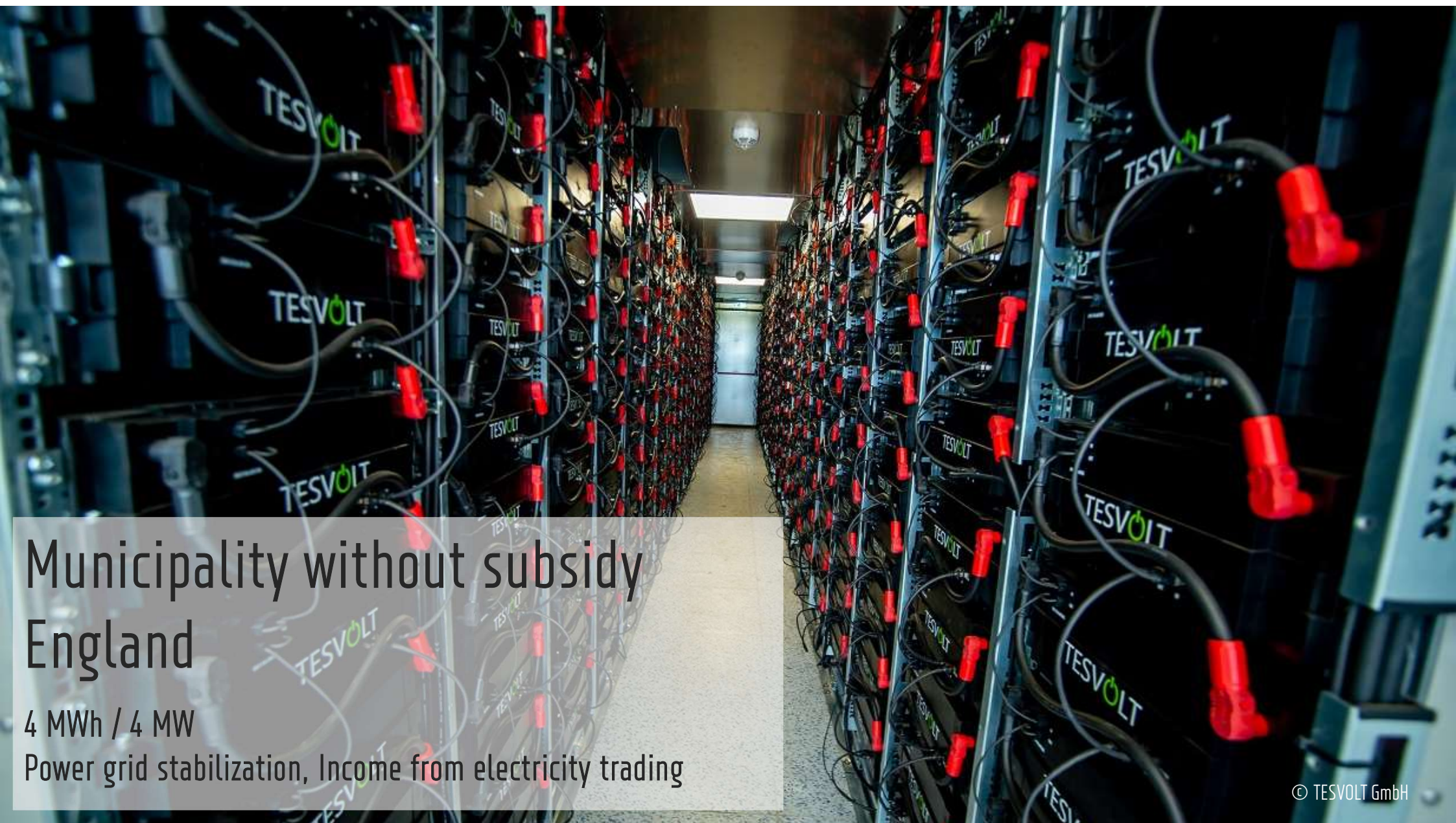




# Oktoberfest Munich - Germany

67 kWh / 60 kW  
Peak Load Shaving





# Municipality without subsidy England

4 MWh / 4 MW

Power grid stabilization, Income from electricity trading





TESVOLT  
THE ENERGY STORAGE EXPERTS

EWE

0800 1014432



AC  
DC (100kW)  
DC (150kW)

STROMTANKSTELLE

STOP

# Electric vehicle charging stations Germany – Oldenburg

67 kWh / 60 kW  
Peak Load Shaving





# Safe power for reliable flows of goods Germany - Neumünster

403 kWh / 120 kW  
Increased Self-Consumption





# Increase self-consumption college Great Britain - Liverpool

134 kWh / 60 kW

Self-consumption optimization in conjunction with combined heat and power plant

# PROJECTS

## Off-Grid





THE smarter award  
2018 WINNER

# Avocado Farm Australia

48 kWh / 18 kW  
Self-sufficient power supply  
Partner: Unlimited Energy Australia



© TSVOLT GmbH



# Hydrogen station Sweden

154 kWh / 36 kW

Self-sufficient power supply

Partner: VänerEnergi AB & Nilsson Energy AB







# Self-sufficient office container

Oman  
28.8 KWh / 4.4 KW  
Self-sufficient power supply





© TESVOLT GmbH





TESVOLT

AWARDED  
LARGEST PROJECT

GLOBAL LEADING  
RES PROJECT  
AFRICA  
2017

DCTI

# Africa

2.68 MWh / 4 MW  
Water for 2,000 Farmers  
Partner: ideemasun





# Mali

3 MWh / 1.6 MW  
Energy for 250,000 people  
Partner: Africa Green Tec





# Solar storage instead of diesel Australia – Christmas Island

14.4 kWh / 11.7 kW

Power supply off-grid, 75% cost savings



© TESVOLT GmbH

# AWARDS & NOMINATIONS



1st place in the "Rising Star" category as one of the most successful start-up companies in all of Germany in the past few years



Off-Grid avocado farm in Australia as an outstanding project



Finalist in the category "Electrical Energy Storage" with the TS HV high voltage storage system



ARE Awards Winner 2019

Award for Rural Electrification for Off-grid avocado farm in Australia



1st place in the category "Most Innovative Product Development" for the self-developed battery management system



Awarded for the largest Off-Grid battery storage project in Africa



WHEN YOU HAVE ANY QUESTION,  
THEN DON'T HESITATE TO CONTACT US.

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