

**AEG**

POWER  
SOLUTIONS

# ENERGY STORAGE: FLEXIBLE ON/OFF-GRID SOLUTIONS





# STORING ENERGY

A key component for energy management in the future

Three key drivers are behind the need for energy storage: the increase of renewable energies in the power generation chain, the attention that both corporations and individuals are giving to their energy consumption/ costs and the necessity of meeting the need for power in the most remote areas of the world.

As the transition to alternative forms of energy such as sun and wind gains momentum, new challenges arise to integrate them into the grid. The first challenge is to store excess energy when demand is low and reinject it when peak consumption arises. Second is the stability of the grid and particularly, the voltage.

Cost-conscious customers want to efficiently manage their energy resources and usage, have increasing needs and expect reliable and secure supply.

Trustworthy sources of electrical power are instrumental to grow economies in remote areas of the globe. Renewables are often available but suffer from intermittency. The need for quality power and ensuring its availability for production processes based on a predictable schedule and minimizing cost is paramount.

Energy storage is part of the answer to those challenges and a key part of the standard power supply solutions of the future.

## A flexible range of solutions and an innovative approach

AEG Power Solutions has designed the core power electronics components that can be used with any battery energy storage system. Thanks to its proven technologies, which are used throughout the power grid, AEG PS is ideally positioned to deliver solutions which can connect the energy storage system to any grid for many applications, such as: covering peak demands, shifting peak currents, frequency control and load distribution. Thanks to our engineering and battery expertise we can customize our system to match specific application needs from voltage regulation to full off-grid power generation.

AEG Power Solutions also developed an innovative concept of combining battery energy storage and power-to-heat for energy storage applications. In this hybrid system, energy is stored both in a battery system and an electrical heating system which are connected to the power converter. This hybrid storage system significantly reduces the cost of primary-frequency power operation.

## Why partner with AEG Power Solutions for your battery energy storage solution?

- AEG Power Solutions has decades of experience with UPS, power electronics and grid integration
- Strong expertise in batteries
- AEG Power Solutions already has all the necessary permits to connect the solutions to most of the local grids
- Reliable, proven systems, based on successful, high-performance solar central inverters
- Unchallenged input voltage range from 330 V – 1000 VDC for any type of battery
- Best-in-class microgrid functionality through our seamless transition option
- Hybrid option to optimize battery capacity and lower capital cost
- Direct development of solutions tailored to each customer's specific requirements in terms of battery capacity and power throughput
- Worldwide service and support network

# STORAGE CONVERTER

## ConvertSC FLEX



As the core element of any battery energy storage system, the converter charges and discharges batteries to store or provide power according to the application requirement such as frequency control, peak shaving, energy shifting (temporary storage to re-inject power when maximizing profitability) and voltage control (often used to balance the voltage instability generated by integration of renewables in the grid).

ConvertSC FLEX bi-directional power converter with IGBT technology is based on the extensive experience of AEG Power Solutions in both power supply and conversion. The latest version of the system benefits from an enhanced power range up to 1MW for a single unit and provides an outstanding conversion efficiency factor for both the charging and discharging phases. ConvertSC FLEX offers a wide range of DC input voltage which spans from 330 V to 1000 V. This allows using the converter with any type of battery technology.

ConvertSC FLEX includes an option for seamless transition between off-grid and on-grid mode. This extends the battery energy system's usage beyond its core functions, such as peak shaving for system back-up in the event of a grid blackout. This feature is crucial when battery energy storage is used in areas where grid reliability is at stake or for full off-grid applications.

Thanks to its on-grid off-grid mode seamless transition capability, this solution for battery storage installation is ideally suited to support any type of energy storage application as well as simultaneously secure power supply for critical processes and infrastructure.

### Storage converter technical data

- Nominal output Up to 1MV
- DC voltage range 330 V – 1000 V
- Max. efficiency 98.4 %
- Frequency 50/60 Hz
- Temperature range -20 °C to +50 °C
- Battery technology Pb, Li, NiCd, VRF, etc.
- Operating mode On-grid & off-grid

### Features

- Seamless transition between off-grid and on-grid mode
- Simplified container integration thanks to its low cabinet depth
- Easy to expand with additional ConvertSC FLEX units
- Emergency power system
- Possible to use any type of battery

### Benefits

- Compatible with in-house and other energy management systems
- Supports various communication protocols
- Remote control via energy management system possible
- 24/7 worldwide access

AEG PS can offer different types of outdoor solutions, these range from a single unit housing to a metal-sheet iso-container housing up to six units. In addition, AEG PS can offer and support solutions for total battery energy storage systems.

The outdoor enclosure is designed to house ConvertSC FLEX, an optional AC low voltage circuit breaker and a communication interface as well as an auxiliary power supply. The outdoor enclosure negates the need to use containers whose weight and size make them difficult to transport and handle. With ConvertSC FLEX, up to four units of the outdoor system can be loaded onto a truck and transported to a site where the complete units can be moved using a forklift truck replacing the need for heavy load cranes.

The outdoor enclosure can offer cost advantages compared to container solutions. Combined with outdoor transformers this is a smart solution for building battery storage installations.

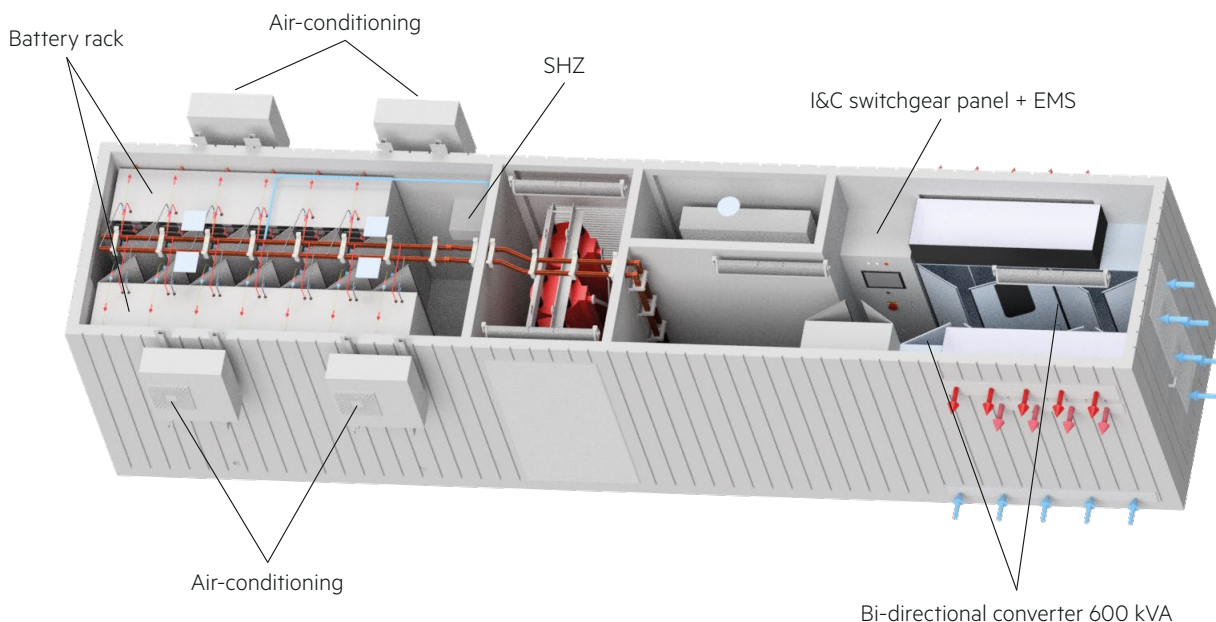


## From converter to turn-key solution

ConvertSC FLEX can be delivered as part of a full battery energy storage solution combined in a container: the power conversion itself, as the

core part of the system, the lithium batteries, medium voltage transformer, switch-gear and all auxiliary components including the

energy management system. This multi-application solution is built with selected partners.



# HYBRID BATTERY STORAGE

An innovative and cost saving concept

AEG Power Solutions' response to the growing challenges posed by the transition to alternative forms of energy is a new technical concept in which proven technologies are combined into a new business model for providing primary control power.

AEG Power Solutions designed this unique concept based on its power electronic expertise. It includes storage converters integrated in ISO-metal sheet containers together with a hybrid storage option, low-voltage distribution cabinets, auxiliary power supply as well as medium voltage transformers and the heating system in separate enclosures.

This hybrid storage system significantly reduces the cost of primary-frequency power operation. First, the required battery capacity is significantly smaller compared to a conventional battery-only system (approx. 50%), and the second source of

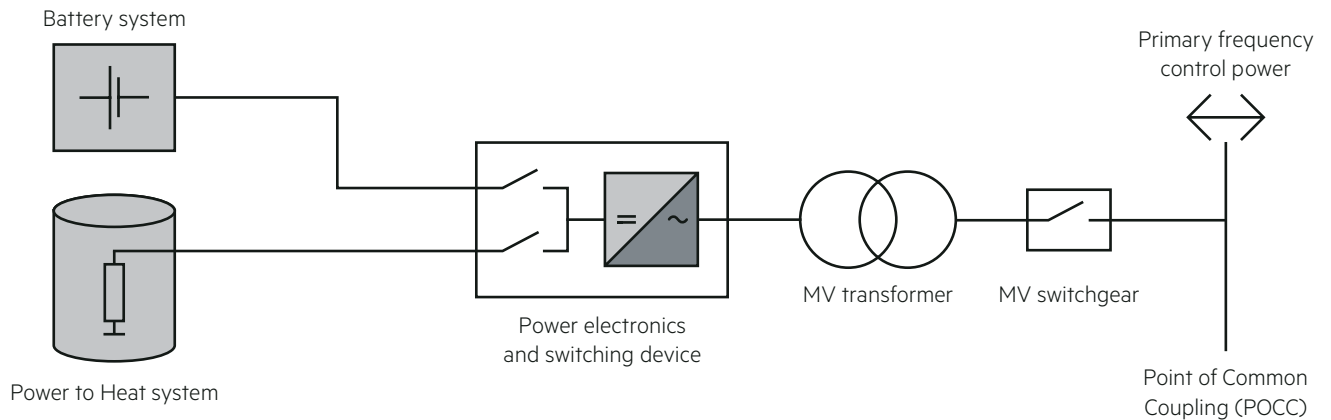
storage (heating) is considerably less expensive. Additionally, power electronics and all components for grid connection (i.e. transformer) are used twice by utilizing both storage systems which contributes to minimizing installation hardware costs.

This improves the payback for the operators of the system and helps to reduce grid fees which is of general public interest.



## Benefits

- Requires only 50% of battery capacity compared to singular batteries with the same pre-qualified power
- Reduction of investment costs
- The system can be qualified and used for positive and/or negative secondary control power (additional potential revenue)





# OFF-GRID EXPERTISE



## Off-grid – Electricity in remote areas

A reliable power supply is one of the most important growth areas worldwide. AEG Power Solutions is focusing on providing hardware to ensure the supply of electricity to remote areas of the world. An important issue is how clean, reliable electricity can be used in remote areas.

Battery Energy Storage is ideally suited to use in off-grid applications. The range of possible applications in such cases is virtually unlimited. Whether we are talking about supplying electricity to remote mines, communication/ industrial sites, or to residential areas: battery energy storage reduces the dependence on fossil fuels for generating power.

## Advantages of renewable energy sources

- Environmentally friendly
- Low-maintenance
- Highly efficient
- Long service life with comparatively low operating costs

## Current off-grid power supply

As most off-grid power generation is provided by a diesel generator, a critical factor for the operating costs of a generator is the rising price of fuel, and transportation costs. Access to remote areas also adds complexity regarding the availability of spare parts & trained technicians for maintenance.

## Power supply using photovoltaics

Over an investment period of 20 years, a photovoltaic solution is about half as expensive as a solution using a diesel generator.

- Lower fuel costs
- Lower maintenance costs
- Less dependence on the price of oil
- Lower environmental impact
- Extremely reliable, durable components

## Wind energy

An optional wind generator can be added to the solution. This decreases the dependence on a diesel generator for power and, in turn, reduces the amount of diesel consumed. As a result, the diesel generator can be made smaller, if required, thereby reducing investment and running costs.

## Energy storage

Combined with renewable energy sources, BESS is a cost-saving and reliable alternative. AEG Power Solutions' provides key components of a battery energy storage off-grid system and links with reliable partners worldwide to provide turnkey solutions if required.

Our converter is designed to be the grid forming unit as it behaves as the voltage source of the system. Its reliability has no match on the market and all dynamics are handled by the unit which significantly reduces costs of the solution. The system is also less complex and easier to maintain.

## Convertsc FLEX

### A control strategy adapted to off-grid

Due to intelligent control algorithms inside of the unit and the consequential approach of using droop-controls inside of the unit, wide area networks and installations are feasible and can be supported.

Furthermore, this approach allows a communication-free Multi-Master operation of several grid-forming units. Benefits are a more reliable and resilient power supply and significant cost savings in the field of necessary communication infrastructure and management software.

Easy-built-up of n+x configurations and the parallel operation with other power sources (conventional and renewables) are inherent features of our solution.





# REFERENCES

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## Energy storage to manage peaks in demand

### **Iberdrola Ingeniería y Construcción**

Together with Iberdrola Ingeniería Construcción and the renowned TECNALIA Research & Innovation organization, AEG Power Solutions has developed the prototype for a grid-based battery energy storage station for handling peaks in demand.

The SAGER project consists of a storage station that is connected to the power grid and stores energy in times of low demand to supply it later in times of high demand. The station monitors the grid load to enable an efficient, safe, and convenient supply of the energy generated on-site.



## Hybrid storage: a brand new concept

### **swb Erzeugung AG & Co. KG (swb)**

A Bremen-based German utility chose AEG PS Hybrid Storage system energy storage for its primary-frequency control power operations. This service is provided to grid-operators to stabilize the grid and is increasingly needed as renewable sources are integrated.

AEG PS has engineered the complete solution, providing swb with 24 storage converters integrated into ISO-metal sheet containers together with a hybrid storage option, low-voltage distribution cabinets, auxiliary power supply as well as medium voltage transformers and a heating system in separate enclosures.



## **AEG Power Solutions**

Approach your local AEG Power Solutions representative for further support.

Contact details can be found on:

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