Delivering secure and flexible energy
World Class System Integrator of Battery Storage Solutions

Bankable, reliable and proven energy

Modern batteries already make an important contribution to the stability of our electricity grids. Increasing the share of renewable energy in future energy mix means that decentralized storage systems are becoming critical. The flexibility that batteries can provide mean that these assets can create value to grid operators, large energy users and existing renewable generation assets via new business models.

Wherever grid connection is constrained load or unavailable, wherever the use of volatile power generators such as photovoltaics and wind power is to be maximized, battery storage finds its place. To meet the challenges and opportunities that batteries can offer, BELECTRIC delivers standardized, container-based battery as well as individual building integrated solutions.

BELECTRIC’s battery storage solutions:

- Flexible system designs: Container-based units and building-integrated solutions
- Variety of applications: Ancillary services, energy trading, load shifting and peak shaving
- Lithium-ion technology with AC power output in multi-megawatt range
- High efficiency: 1,500 Vdc system voltage
- Fully diagnosable local SCADA and interface to remote control center
- Advanced battery controller for inverter, BMS, HVAC, safety and data storage
- Professional trained and experienced operation and maintenance team
- Comprehensive warranties over 10; guaranteed bankability

Global battery storage deployment 2016 - 2030

As one of the leading battery storage system integrators, BELECTRIC can deliver battery solutions all over the world to meet the growing demand of this business area.

Values: Bloomberg New Energy Finance
# Applications for Large-Scale Battery Power

## Battery Storage Applications

<table>
<thead>
<tr>
<th>Feature</th>
<th>Utility, grid operator</th>
<th>High energy users</th>
<th>Electric mobility provider</th>
<th>Off-Grid Applications</th>
<th>Renewable energy operator</th>
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</thead>
<tbody>
<tr>
<td>Grid stabilization in frequency, voltage and reactive power, RoCoF response</td>
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<tr>
<td>Advanced grid services: load shifting, peak shaving, point following</td>
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<tr>
<td>Uninterrupted power supply (UPS) / emergency power</td>
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<td>Buffering solar and wind power</td>
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<tr>
<td>Energy management system and hybrid power control</td>
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<tr>
<td>Limited local grid connection</td>
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<td>Micro grid with black start capability</td>
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</table>

- **Fast Frequency Response**
- **Energy Trading**
- **Peak Shaving**
- **Hybrid**
Flexible Battery Business Models

BELECTRIC delivers bespoke systems to meet all commercial applications

BELECTRIC has been at the forefront of battery system design since 2014, integrating and building bespoke systems to meet a variety of energy applications. Below you will find a selection of the most important business models for operating large-scale battery storage systems.

### Frequency Control
**Response (FCR)**

**Application:** Tracing back of frequency, e.g. to 50Hz

**Battery:** High C-rate batteries to deliver power for short durations

**Customer:** Utilities, Developers, TSOs

### Peak Shaving / Load Shifting

**Business:** Relief of the grid

**Battery:** Delivering power to utility-scale and industrial users to avoid the installation of infrastructure to meet peak periods of demand

**Customer:** Corporate and Industrial users, DNOs, TSOs

### Wholesale Energy Trading

**Business:** Buy cheap, sell expensive

**Battery:** Number of events depending on gap between low and high price (between 10 - 400 events per year); charge/discharge with full power; low C-rate app., i.e. high capacity, low power

**Customer:** Corporate and Industrial users
Technical Excellence delivering Financial Performance

One-Stop Shop for Design, Delivery and Operations

BELECTRIC supports customers during the development process with techno-economic modelling to ensure the optimal cost design for the required business case.

BELECTRIC has been developing and building large-scale PV plants since 2002. With the knowledge of more than 2GWp of commissioned PV capacity, BELECTRIC has now realized over 100 MWh in international battery storage projects.

Customization of system design by experienced battery storage engineers

- Degradation and SoH Analysis
- Sizing Simulation
- Life Time Simulation

- Mechanical Design
- Electrical Design
- Communication
- Structure Design

- Battery Control System
- Energy Management
- Advanced SCADA

- Procurement
- Construction
- Commissioning
- Quality Assurance
Installation of the large-scale battery storage plant in Herdecke, Germany

- 24/7 Monitoring
- Data Warehouse
- Control Center
- Corrective Maintenance
- Reactive Maintenance
- Operation Data Analysis

MONITORING

MAINTENANCE & ANALYSIS
What are Your Requirements?

Container-based and building-integrated Battery Storage Systems

Standardized battery storage container or individual building integrated solutions – at BELECTRIC every solution can be customized to your requirements. The choice of the appropriate battery storage model depends on different factors and customer requirements. BELECTRIC supplies bespoke battery storage units that can be integrated into existing buildings or new buildings. This design is particularly suitable for capacity requirements greater than ~20MWh. In addition, building-integrated units create greater flexibility for augmentation strategies and lower cost O&M fees.

Building-integrated Battery Storage

- Highest cost efficiency for large-scale projects
- Highest flexibility in system design
- Independence in components and battery technology
- Best fit to customer’s requirements
Container-based Battery Storage

BELECTRIC offers standardized, containerized solutions for decentralized grid support. These offer short delivery times and are scalable. The battery storage units are delivered preconfigured to site and can be put into operation within a short time. Their high degree of standardization enables a cost-efficient production.

**Technical specifications:**
- 20’ and 40’ high-cube container
- Rise of output power from 0 to 100% in 55ms
- High power output, maximized capacity per unit
- AC: 6-33kV
  DC: 1,500V system voltage
- Battery technology: Lithium-Ion
- Cycle life: up to 8000 full cycles
- Battery cell equilibration, BMS, HVAC, SCADA

**ONE TECHNOLOGY**
BELECTRIC Battery Power for Global Electricity Grids

Global track record, valued by renowned customers

BELECTRIC has developed and implemented a large number of battery storage systems worldwide. As one of the leading battery storage system integrator, we rely on a constant technology transfer from research projects to everyday battery storage systems.

International R&D projects with established organizations:

**Project:** Enhanced Frequency Control Capability  
**Country:** UK

**Project:** Showcase Intelligent Energy SINTEG  
**Country:** Germany

**Project:** PV Power Plant of the Future  
**Country:** Germany
Leading customers from all over the world trusting proven battery solutions from BELECTRIC

- Germany: 63 MWh, 41 MWp
- United Kingdom: 25 MWh, 36 MWp
- Puerto Rico: 5 MWh, 15 MWp
- Somalia: 1 MWh, 1 MWp
- Ireland
- Hungary
- Italy

VATTENFALL, RWE, Foresight Group, innogy
Leading Battery Storage Systems

BELECTRIC GmbH is one of the most successful enterprises in the development and construction of utility-scale solar PV power plants and battery storage systems. The company was established in 2001 and has been expanded to an international group with activities on all continents since then.

BELECTRIC has constructed over 300 solar PV power plants with around 2 GWp PV capacity. In addition, the company realized battery energy storage systems and hybrid power solutions, which combines different technologies to autarkic systems. As one of the largest O&M providers globally, BELECTRIC’s full-integrated services provide continuous operation.

BELECTRIC GmbH
Wadenbrunner Str. 10
97509 Kolitzheim, Germany
Phone +49 9385 9804-0
ebu@belectric.com

Please check out BELECTRIC international branch offices for direct contact at:
www.belectric.com/de/international/

Visit us at:
www.belectric.com