Energy storage solutions for utility-scale applications

Providing grid stability and supporting higher penetration of renewable energy

solar.schneider-electric.com
Experience you can bank on

Products, service and support from a bankable partner
With a 180-year history, two decades of expertise in solar power conversion and more than 7 GW of utility-scale power conversion installations, Schneider Electric brings you peace of mind for long-term reliability, service and support.

As a global business with operations in over 100 countries, Schneider Electric has the scale to support installations anywhere. We believe in the importance of strong relationships between our dedicated service teams and our customers in each region and our local service manager is only a phone call away whenever we have the opportunity to help.

Proven expertise
Schneider Electric offers a full range of solutions from the inverter to the grid connection, with the expertise and resources to help you achieve your system performance goals.

- Power conversion
- Monitoring and control
- Low voltage and medium voltage power systems
- Grid code compliance and interconnect solutions
- Experience with a full range of solar and energy storage applications

Global specialist in energy management
180 years of history
€27 billion in consolidated revenue

160,000+ total workforce in 100+ countries
5% of total revenue invested in R&D

Make the most of your energy

43% sales in new economies
€2.1 billion adjusted net income

#1 or #2 player in 90% world group sales
Leveraging combined expertise in energy management, system controls, power conversion and energy storage technologies, we support a wide range of applications, meeting the needs of different customers as diverse as generation companies, transmission and distribution system operators, or large commercial or industrial end-users.

**Renewable Energy Shifting and Firming**
Charge the battery with excess of renewable energy during off-peak periods to release it onto the grid during peak periods, and possibly to follow a pre-defined generation pattern.

**Electricity Rate Optimization**
Store electricity when the market price is low and consume it when the market price is high.

**Renewable Energy Smoothing**
Charge/discharge the battery to smooth intermittent generation and follow soft power injection ramps.

**Ancillary Services**
Automated control of active and reactive power for voltage and frequency regulation.

**Investment Deferral**
Store energy close to consumers during off-peak periods and release it during peak periods to avoid having to re-invest in new transmission or distribution infrastructure.

**Peak Shaving**
Energy is stored during off-peak hours to be used during on-peak hours. Can be used to manage peak demand.

**Microgrids, Diesel Abatement**
Use storage in isolated grids in conjunction with renewable energy and fossil fuel sources.

**Large End-Users**

**Renewable Energy Generation**

**Life Is On**
Utility-scale storage architecture

The seamless integration of power conversion with smart control
Bi-directional PCS for utility-scale energy storage

Flexible solutions for a wide range of storage technologies

**Conext SmartGen™**
- Up to 1500 Vdc
- Certified to UL1741 (including IEEE 1547), EN50178, EN61000-6-2 and EN61000-6-4
- Outdoor rated, wide range of operation from -40°C to 60°C
- True Design for Service™ for faster, easier service
- Predictive maintenance supported by Conext™ PowerCloud

**Conext™ Core XC-NA ES**
- Up to 885 Vdc
- Certified to UL1741 (including IEEE 1547)
- Outdoor rated, wide range of full power operation from -20°C to 50°C, with -35°C option
- Best in class efficiency
- Inverting mode: 98.6% peak, 98% CEC
- Rectifying mode: > 97.5%

**Conext™ Core XC ES**
- Up to 885 Vdc
- Certified to EN50178, EN61000-6-2 and EN61000-6-4
- Indoor rated, wide range of full power operation from -10°C to 45°C
- Best in class efficiency
- Inverting mode: 99.1% peak, 98.5% Euro
- Rectifying mode: > 97.5%

**COMMON FEATURES**
- 4-quadrant operation at full active power
- Primary reserve functions: inertia emulation, P(f) drooping, Q(V) drooping
- Secondary reserve functions: PQ / Ppf / PV dispatch mode, fast and accurate command
- Response transient time for mode reversal (active power sinking/sourcing) < 5 msec
- Embedded power ramping capability
- DC ripple current < 1%
Reliable power conversion solution

Seamlessly integrated solution allows for easy planning, installation, and operation

Our PCS substations integrate multiple converters with a medium voltage transformer and switchgear, battery protection, auxiliary power distribution, as well as a PLC-based control cabinet for the power block.

Different methods and options enable installation in all geographies and environmental conditions, thus allowing a reduction of balance of system costs, increased reliability, and faster deployment for all energy storage projects worldwide.

**Conext SmartGen Power System**
- Up to 1500 Vdc
- 1.3MVA to 4.0MVA
- Conext SmartGen inverters
- Designed to UL and IEC standards
- Also available as a kit that can be site integrated

**ES Skid**
- Up to 885 Vdc
- 540kVA to 2.04MVA
- Conext Core XC-NA ES inverters
- Complies to NEC 2014
- NEMA Type 3R rated for outdoor applications

**ES Box**
- Up to 885 Vdc
- 540kVA to 2.72MVA
- Conext Core XC ES inverters
- Design based on IEC 62271-202
- 3 compartments: low voltage, transformer and MV switchgear
- Optional integrated filtering units for desert, coastal, or tropical environments
Comprehensive monitoring and control solution

Conext™ Advisor 2
Conext Advisor 2 is a cloud-connected monitoring and control solution providing one single web portal with all the necessary functions to manage your energy storage power plants.

• Real-time monitoring and control, metrics and forecasting
• Long-term performance analysis and asset management
• Produce clear and actionable reports with useful guidance
• Power Plant Controller (PPC) options for grid code compliance and grid support

Power Plant Controller (PPC)
The PPC fulfills the utility compliance requirements by providing automated active and reactive power regulation for Solar and energy storage plants. The PPC embeds operation modes that are adjustable for different grid codes and manages both medium or high voltage point of connection.

PPC settings can be configured through the Conext Advisor 2 user interface or by Energy Management System signals and/or grid operator commands.

Energy Management System (EMS)
The EMS makes the energy charging and discharging decisions, and uses smart energy optimization algorithms based on battery status, production forecasting, load forecasting and/or tariff information. It can also interface with the PPC to ensure compliance of power delivery according to grid code requirements.
Services for utility-scale energy storage

Design, execution, and field services that make the difference

Each energy storage application is unique and requires careful consideration – from the selection of the batteries, to the testing and servicing of the system. At Schneider Electric, we have engineering and field services teams that are ready to support you from the design phase, all the way to the operation of your energy storage system.

Engineering services

- Storage technologies
- Front-end engineering consulting
- System sizing
  - Number of cycles for an expected usable life
  - End of life sizing
  - C rate sizing
  - Depth of discharge sizing
  - Sizing with LCOE / LCOS objectives
- Power system modeling
- System performance calculations
- Project management

Field services

- Equipment commissioning and startup
- Plant commissioning and startup
- Site performance testing
- Customer training
- Preventive and corrective maintenance
- Remote support
Battery compatibility

Our solutions include a wide range of DC operating voltages and configurable charging and discharging modes making our solutions compatible with most utility-scale battery technologies.

The right battery storage technology

There are many storage technologies available today, and some are better suited for certain applications than others. Schneider Electric helps select and specify the optimum technology for projects.

<table>
<thead>
<tr>
<th>Li-Ion</th>
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<tbody>
<tr>
<td>Lithium Manganese Spinel (LMO)</td>
<td>✔</td>
</tr>
<tr>
<td>Lithium Nickel Cobalt Aluminum (NCA)</td>
<td>✔</td>
</tr>
<tr>
<td>Lithium Nickel Manganese Cobalt (NMC)</td>
<td>✔</td>
</tr>
<tr>
<td>Lithium Titanate (LTO)</td>
<td>✔</td>
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<tr>
<td>Lithium Iron Phosphate (LFP)</td>
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<tr>
<th>Flow</th>
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<tbody>
<tr>
<td>Vanadium Redox</td>
<td>✔</td>
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<tr>
<td>Zinc Bromine (ZBM)</td>
<td>✔</td>
</tr>
<tr>
<td>Zinc Redox</td>
<td>✔</td>
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<tr>
<td>Iron Chromium</td>
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<tr>
<th>Molten salt, high temperature</th>
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<tbody>
<tr>
<td>Sodium Sulphur (NaS)</td>
<td>✔</td>
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<tr>
<td>Sodium Metal Halide (ZEBRA)</td>
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<th>Others</th>
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<tbody>
<tr>
<td>Aqueous Sodium Ion</td>
<td>✔</td>
</tr>
<tr>
<td>Advanced Lead Acid</td>
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Table based on available product literature. Compatibility to be reviewed case by case based on battery manufacturer detailed data.
Reference projects

Exploring storage benefits from a system operator’s perspective
Venteea, France
The Venteea project site is located in the Northeast of France, a rural area with high penetration of wind power generation. Another challenge faced by the system operator is that the MV substation at the end of the transmission line was seeing high voltage swings. The goal of the project was to implement an energy storage system on a rural 20 kV network in the vicinity of two decentralized wind farms (6 and 12 MW) and to help stabilize the high voltage swings of the MV substation. For this project, two Schneider Electric ES Box units (1 MW each) were installed, along with 2 MW / 1.3 MWh Li-ion batteries.

Experimenting with dispatchable PV power
Corsica, France
This project on the island of Corsica consists of two PV power plants (1MWp each). The goal of the installation is to firm and shift the production of energy and make it dispatchable. The production plan at day D must be announced at day D-1 with narrow tolerances on level and time. Energy produced during the day is stored in batteries and dispatched at night. The two plants generate enough energy to meet the electricity needs of more than 400 homes in Corsica. Schneider Electric’s PV Box and ES Box are installed in each plant, along with Li-Ion batteries. The installation also includes Conext™ Control, Conext™ Advisor with Horizon Production Forecast, a Power Plant Controller, and an Energy Management System.

Increasing the penetration of intermittent renewable energy sources
Puerto Rico, USA
This project in Puerto Rico is located in an area that has a weak grid with high renewable energy penetration. The energy storage solution allows for a higher penetration of intermittent renewable energy sources without compromising the grid stability. The installation includes a 40 MW PV power plant with 27 Schneider Electric 1.36 MW PV Boxes and 9 of our 2MW ES Boxes, along with a 19 MW Li-Ion battery storage. The energy storage applications for this project include sub-second frequency regulation, voltage regulation, and power ramping to smooth active power injection during PV power fluctuations.