MAN BESS
Battery energy storage system

As the share of renewable energies grows, so does the importance of energy storage. The MAN battery energy storage system (MAN BESS) helps improve the reliability, availability and efficiency of your power supply. MAN BESS is ideal for high power applications such as spinning reserve or frequency regulation and plays a key part in hybrid power solutions.

Benefits at a glance

- Make your assets more flexible, reliable and profitable
- Ideal for use in multiple applications (revenue stacking)
- Suitable for high-power and high-energy applications
- Complete system integration from a single source at MAN
Battery storage for supply security and reliability

Wide range of applications

Battery storage is suitable for many applications, either deployed as a stand-alone system or as part of a hybrid power system integrated with engines, turbines and/or renewables.

Flexible power capacity makes MAN BESS easily scalable for different applications: Utilities improve their power quality. Islands and microgrids can increase their renewable penetration, which results in lower leveled electricity costs. Industrial customers can improve their investment and energy costs while ensuring security of power supply.

Key element in hybrid power solutions

MAN provides a full range of hybrid products and services that support global decarbonization targets. MAN BESS is a key element of hybrid solutions that allows higher penetration of fluctuating renewable energy sources like sun and wind in combination with engine or turbine power plants. MAN BESS also improves the efficiency and reaction time of thermal power plants and make it possible to operate them at a more constant level.

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MAN competence and scope of supply

MAN BESS is available on a turnkey basis including power electronics, battery management, battery plant control, and grid connection. All components like battery modules and inverters are sourced from leading suppliers and integrated by MAN.

MAN PrimeServ provides support across the full asset life cycle and optimizes the value of the BESS. PrimeServ Digital Services offers remote monitoring and real time visualization of operations and helps our customers to optimize their assets.

Main applications

- Spinning reserve
  Maintain system stability, especially in emergency conditions and during unpredictable load changes.
- Frequency and voltage regulation/response
  Provide grid services (balance fluctuation, manage frequency and reactive power).
- Renewables smoothing and integration
  Keep the net volatile output of wind and photovoltaic within certain levels; balance local excess of deficits.
- Black start
  Energize a system in the event of generation or grid outage without outside assistance.
- Transmission and distribution optimization
  Defer or avoid upgrades of transmission and distribution system; load leveling close to loads; improve power quality.
- Capacity
  Provide energy for peak and base load consumption; avoid RES curtailment; shift RES to times of high demand.
- Extendable for further applications according to customer requirements.

System data

<table>
<thead>
<tr>
<th>Power</th>
<th>1 MW – 100 MW+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>1 MWh – 100 MWh+</td>
</tr>
<tr>
<td>Installation</td>
<td>Container or building</td>
</tr>
<tr>
<td>Container dimensions</td>
<td>40” high cube (12.2 x 2.4 x 2.9 m)</td>
</tr>
<tr>
<td>Cooling</td>
<td>Air-cooled batteries, liquid-cooled drives</td>
</tr>
</tbody>
</table>

Electrical data

| Battery | Individual selection depending on application |
| Technology | Lithium-ion, NMC type |
| Modularity | Scalable in 100 kWh increments |
| Efficiency | > 97 % (converter) |
| DC voltage | 74 V – 1000 V |
| AC voltage | MV AC voltage chosen on project basis |
| Frequency | 50 Hz/60 Hz |

Configurations

| High power | <= 2C (6 MW/3 MWh per container) |
| High energy | <= 1C (3 MW/3.5 MWh per container) |

Standard configuration – individual configurations based on specific customer and project requirements.

MAN energy management system

MAN BESS is equipped with an energy management system (EMS) that monitors, controls and optimizes the energy storage system. The EMS controls services such as frequency regulation, spinning reserve or renewables smoothing. It also integrates the MAN BESS with renewables and thermal power plants into hybrid power solutions and defines the operating strategy for the lowest possible generating costs for each period. The MAN EMS will be configured to maximize the value of the asset for the customer.

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All data provided in this document is non-binding. This data serves informational purposes only and is not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

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