Energy Storage

GRID-SCALE ENERGY STORAGE SOLUTIONS

Powering the Future of Renewable Energy

A Rolls-Royce solution

ROLLS-ROYCE, YOUR STRONG AND RELIABLE PARTNER FOR COMPLEX AND GRID-SCALE BESS PROJECTS

At Rolls-Royce, we provide world-class power generation and energy storage solutions including life-cycle services under our product and solution brand ***mtu***.

Fully utilizing the potential of digitalization and electrification, we strive to develop climate-neutral drive and power generation solutions that are even cleaner and smarter and thus provide answers to the challenges posed by climate change and the rapidly growing societal demands for energy and mobility.

Our comprehensive portfolio includes diesel and gas generator sets, combined heat and power (CHP) systems, energy storage solutions, and advanced microgrid automation and control. These technologies enable independent and decentralized energy supply, ensuring a stable and resilient energy infrastructure.

As a global leader in mission-critical applications, we provide highly complex, integrated power systems that meet the toughest performance and safety standards. Our solutions power hospitals, data centers, and industrial facilities, ensuring uncompromising reliability where it matters most.

The increasing integration of renewable energy, electrification, and advancements in energy storage are driving a transformation in the energy landscape. Our systems contribute to this transition by ensuring grid stability and energy security.

With over 110 years of expertise and a proven track record in gigawatt-scale power installations our customers know they can rely. We are committed to delivering sustainable, intelligent, and resilient power systems—ensuring reliable and efficient energy today and into the future.

World class technology company
with more than 100 years of history, over 41,000 employes and more than £17 bn revenue

Track record of multi-MWh
BESS projects and GW-scale power plant installations

Global leading supplier for mission critical applications
with toughest requirements and highest complexity of integrated solutions

Global Service Network
more than 350 Service Partners, 24/7 customer access

EMPOWERING THE ENERGY TRANSITION

Grid-scale storage for a renewable future.

In response to rising electricity demand driven by economic growth and population increases, the energy sector is undergoing a significant transformation. As governments and industries worldwide move toward distributed renewable energy sources, traditional centralized grids are facing new challenges. To meet these demands, the ***mtu*** EnergyPack QG provides a cutting-edge solution for grid-scale energy storage, seamlessly integrating renewable sources like solar and wind power.

The scalable design is optimized for front-of-the-meter grid-scale battery energy storage systems with typical storage capacity ranging from MWh to GWh scale. It ensures grid stability, enhances energy reliability, and supports the transition to future-ready, sustainable power systems.

Combined with the ***mtu*** EnergetIQ Manager, it intelligently manages energy storage and dispatch, bringing together high-quality hardware, advanced software, and unparalleled service.

Make a smart investment in the future of energy with our innovative storage solution—ensuring a resilient, reliable, and sustainable power supply for tomorrow's energy needs.

Semperpower, Netherlands:
The ***mtu*** EnergyPack QG system project for Semperpower is the largest battery storage system in the Netherlands as of its commissioning and ranks among the largest in the European Union. Our team provided a full EPC solution for this project. Installed power: 30.7 MW / 62.6 MWh

PROVIDING YOU WITH EVERYTHING YOU NEED—A TRUE TURNKEY SOLUTION

We offer end-to end, high-performance solutions tailored to your needs—reducing project complexity and thus your risk. At a glance, our offering includes:

Complete BESS Solution

We deliver a fully integrated Battery Energy Storage System (Battery + MVPS) built for maximum performance and efficiency. Our cutting-edge technology ensures low Levelized Cost of Ownership (LCO) with top-tier safety, reliability, and a long lifecycle.Factory-tested modules reduce installation time, costs, and risks, while high energy density and an optimized system layout minimize land use. With high round-trip efficiency, slow degradation, and ultrafast response, our solution is ideal for the most demanding grid-scale applications.

Intelligent Control System with *mtu* EnergetIQ

Our in-house developed system ensures seamless integration, control, and optimization of energy assets —including third-party systems. It offers reliable operation, cloud-based monitoring, data management and visualization, all with robust cybersecurity safeguards.

Comprehensive EPC Services

Simplify your project with our full turnkey BESS solutions, including civil works and complete EPC responsibility.
With a proven track record in genset and BESS projects, we ensure on-time, high-quality delivery.
As your end-to-end partner, we support you throughout the entire project life cycle—from planning to end-of-life—backed by 110+ years of OEM expertise.

Reliable Service & Maintenance

We reduce operational risks with long-term performance and availability guarantees, long service intervals, and lifecycle support. Our market-leading components feature a liquid-cooling system for low cell temperature deviations, ensuring high lifetime. The latest battery generation offers zero degradation over the first five years and cycle life up to >15,000.

mtu ENERGYPACK QG CONFIGURATIONS

Flexible and modular system design tailored to your project needs.

The ***mtu*** EnergyPack QG is built on a modular, standardized, and serialized design, enabling flexible system configurations at any scale—precisely tailored to your specific needs. The system consists of six essential components: battery racks or containerized systems, power conversion system, medium-voltage (MV) transformer, MV switchgear, auxiliary power cabinet, and the ***mtu*** EnergetIQ asset controller. These components work seamlessly to deliver a comprehensive, high-performance solution for a wide range of applications, including renewable energy integration, grid services, energy trading, peak shaving, and more.Every solution integrates advanced control systems, fire suppression, and liquid cooling and heating, ensuring reliable operation and maximizing the lifetime of your storage capacity. The entire system is monitored and controlled through our intelligent ***mtu*** EnergetIQ platform, supported by a remote monitoring center (RMC) and global service organization, guaranteeing maximum performance, uptime, and safety. With over 110 years of experience as an OEM, we've built a legacy of engineering excellence, robust internal processes, and deep industry knowledge. This heritage empowers us to deliver best-in-class energy storage solutions that optimize performance, safety, and long-term value—backed by a partner you can trust.

Our modular approach:

Inhouse Rolls-Royce control system

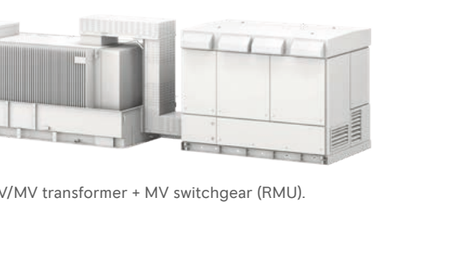
mtu EnergetIQ Manager S, M and L and ***mtu*** EnergetIQ BESS Controller.

At the heart of our system is the Rolls-Royce in-house control system, which ensures seamless integration, intelligent energy management, and optimized plant performance.

Images may be updated to reflect ongoing technical developments.
For the most accurate and current version, please contact our team.

Energy Storage – rack-based or containerized

We have established strategic partnerships with top-tier suppliers such as CATL, the world's leading battery manufacturer, recognized for its advanced technology, outstanding quality, and proven performance. Our battery storage solutions are highly scalable, supporting system sizes from megawatt to gigawatt scale, based on modular base units ranging from 3 to 9 MVA. Configurations are available for durations from 1 to 4 hours, with C-rates of 0.25 C, 0.5 C, and 1 C to suit varying application needs. The systems are designed to operate reliably in a wide range of environments, with a standard temperature operating range from -20°C to +40°C, and an optional extended range from -30°C to +55°C.



Multiple rack solutions available, tailored to project needs, utilizing the latest technologies such as EnerOne+ from CATL.

CATL TenerS – next generation integrated battery container
20 ft-HQ container | ~6 MWh | 0.5 P | ~400 KWh/m2.

MV power station modules

We leverage our strong global network of inverter manufacturers to deliver the most efficient and cost-effective solutions for our customers. By selecting the optimal setup based on the latest technologies from leading Tier 1 suppliers such as SMA and PE, we ensure the highest performance and reliability in our solutions, tailored to meet specific customer needs.

Our MV skid options, designed for output voltages ranging from 10-33 kV (other options available on demand), are engineered to provide seamless integration and robust functionality. Whether you're looking for a standard or customized configuration, we have the expertise to provide reliable and scalable power solutions, all while maintaining the highest industry standards for efficiency, safety, and sustainability.

1 x PE inverter + LV/MV transformer + MV switchgear (RMU).

1 x SMA inverter + LV/MV transformer + MV switchgear (RMU).

2 x PE inverters + LV/MV transformer + MV switchgear (RMU).

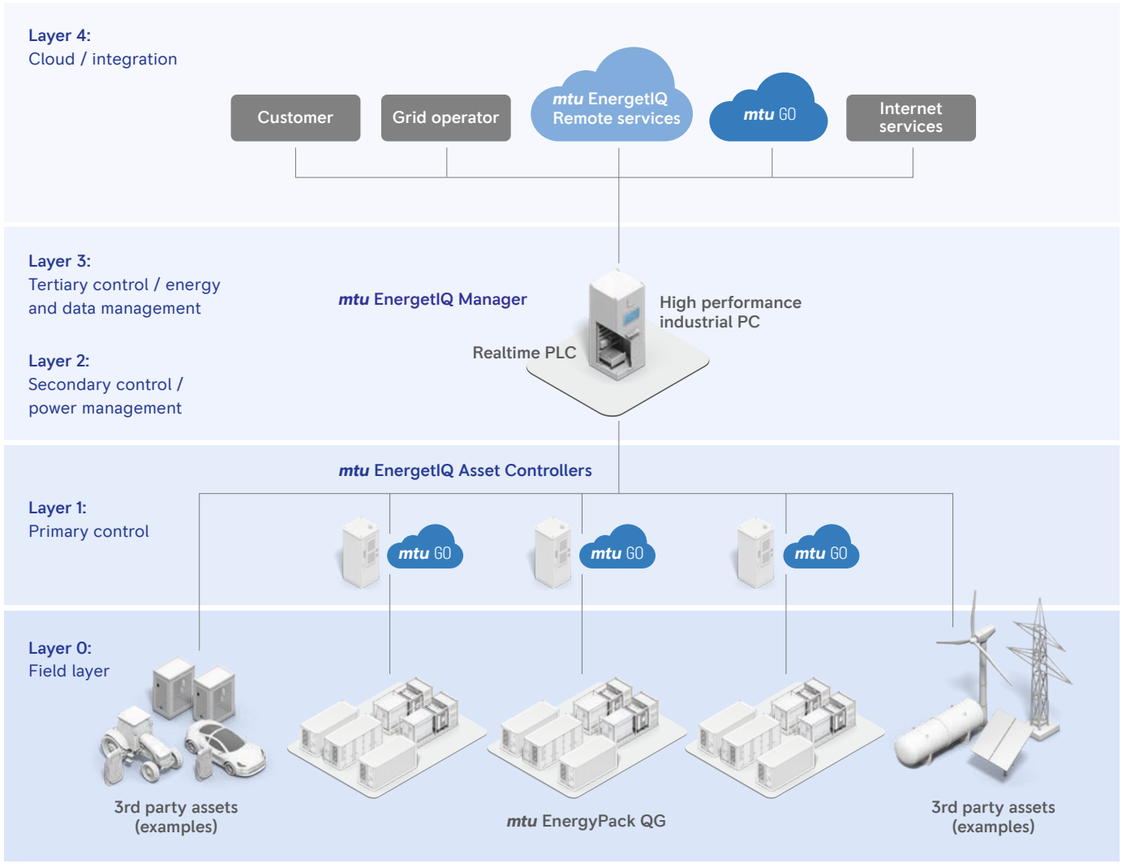
SERVING A WIDE RANGE OF TARGET APPLICATIONS

From generating additional revenues to increasing grid stability—how the ***mtu*** EnergyPack QG paired with our ***mtu*** EnergetIQ Manager creates value across multiple applications.

Application	Explanation	Customer Drivers	Assets
Price Arbitrage	Trading energy in Day-ahead & Intraday markets to capitalize on price fluctuations.	Revenue generation	BESS standalone
Ancillary Services	Enhancing grid stability by providing balancing capacity and frequency regulation.	Revenue generation	BESS standalone
Long-term Capacity Payments	Delivering energy through Power Purchase Agreements (PPAs) to end consumers.	Stable income stream	Renewables + BESS (+gensets)
Grid Booster	Serving as a grid reserve to increase capacity and reduce redispatch costs.	Cost efficiency, Reduced grid infrastructure investment	BESS standalone
Renewable Integration	Maximizing renewable energy usage by preventing curtailment and enabling storage.	Cost efficiency, Sustainability	Renewables + BESS
Backup Power	Ensuring power availability during grid failures or outages.	Energy security, Sustainability	BESS (+gensets)

mtu ENERGETIQ: THE BRAIN OF YOUR POWER PLANT

The ***mtu*** EnergetIQ platform is the brain of your power plant. It optimizes the performance of your power plant through seamless control and integration of its equipment and consists of different levels covering all control stages.
The ***mtu*** EnergetIQ BESS Controller assures safe and efficient operation of the ***mtu*** EnergyPack QG and serves primary control functions. It also manages the battery data with regards to warranty requirements and data analytics. The ***mtu*** EnergetIQ Manager controls groups of power generation and storage assets and the power management—including grid compliance functions—and the energy management.



KEY SYSTEM COMPONENTS

mtu EnergetIQ BESS Controller

The BESS Controller assures safe and efficient operation of the *mtu* EnergyPack QG and manages all its related data.

Control functions
- Control of subcomponents (Engine, AVR, Inverter, BMS, ...)
- Internal control loops to increase asset performance

Protection functions
- Asset protection
- Grid protection (for single assets)

Asset Data Management
- Warranty data / Performance data / On-premise Battery Analytics
- Local storage / Cloud connectivity

Visualization
- Operator HMI
- Engineering / Service HMI

mtu EnergetIQ Manager

The Manager manages the BESS plants and mixed asset plants at various scales, providing all required the functions in one.

SCADA System
- Data management / Trending / On-premise Battery Analytics / Alarm management
- Visualization & Monitoring / Notifications / Reporting / IT-APIs

Switch Gear Controller
- Breaker control / Protection functions
- Sequences of operation (Islanding / Back Synch / ..)

Application Manager
- Group control / Grid services / Trading
- Peak shaving / Self-consumption Increase / ....

Power Plant Controller
- Grid code compliance
- Grid operator Interfaces: IEC 60870 / IEC 61850 / custom

Microgrid / Master Controller
- Rule based power dispatch (fast reactions / stability)
- Mathematical optimization (costs / emissions / ...)
- Management of electrical & thermal energy

ADVANTAGES OF OUR PROPRIETARY AUTOMATION SOLUTION

MAXIMUM DATA & CYBER SECURITY
Inhouse developed platform

Scalability
- Highly scalable ***mtu*** EnergetIQ automation solutions for projects of any size
- Supports single BESS, industrial microgrids, or GW-scale plants with multiple ***mtu*** EnergetIQ Managers

Full stack solution
- Seamless data flow from field equipment to cloud for data consistency
- Integrated automation solution reduces system complexity and software management effort
- Aligned interfaces minimize integration effort

Availability
- Built on industry standards
- Redundancy options including controller, network and I/O redundancy meet highest availability requirements
- C-HIL[1] test environment ensures smooth integration and operational reliability

Cyber security
- Rolls-Royce Power Systems Information Security Management System is aligned with ISO 27001 requirements
- Development process is certified according to IEC 62443-4-1 ML 2 to assure product-level cybersecurity

Optimization
- AI-powered on-premise optimization of plant and microgrid performance (SPARC[2])
- Processing load and production data, electricity prices, and weather forecasts
- Supports advanced application stacking to maximize economic performance, for example, combining energy markets and local energy optimization

Battery Analytics
- On-premise analytics for battery performance insights and KPI tracking
- Early warning algorithms enable predictive maintenance for improved availability

Connectivity
- Connection to ***mtu*** Go for fleet management, service processes, cloud data storage etc.
- VPN solution for remote troubleshooting and updated by the Rolls-Royce service organization
- Customer remote access option to the ***mtu*** EnergetIQ HMI for monitoring and (restricted) control

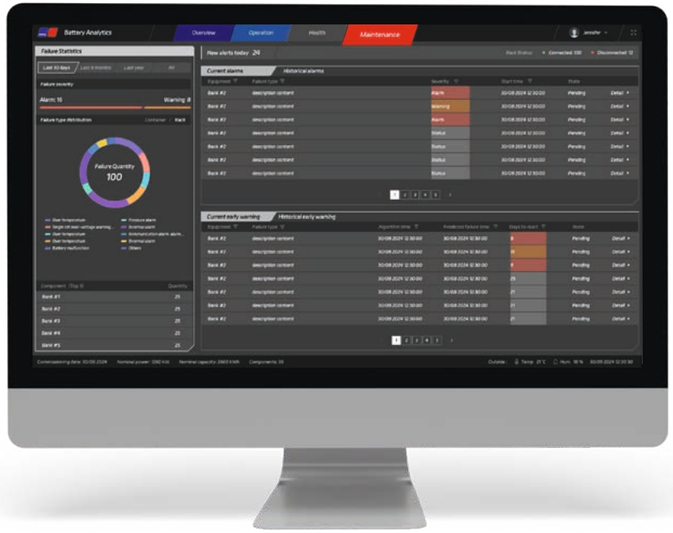
[1] Controller-Hardware-in-the-Loop simulation
[2] System optimizer for advanced energy dispatch

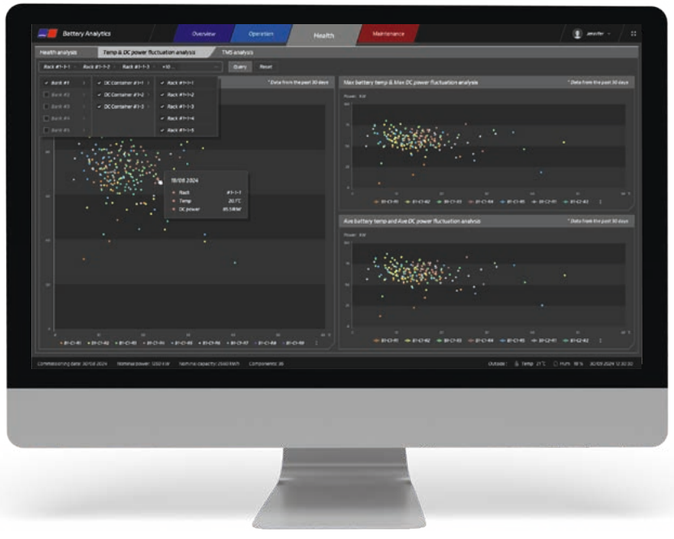
BATTERY ANALYTICS

For performance insights and predictive maintenance.

The battery analytics software is locally hosted on the ***mtu*** EnergetIQ platform and offered as part of our service solutions.

Features
- **Higher accuracy** for State of Health (SOH) and internal resistance calculation
- **Anomaly detection** for voltage, temperature
- **Imbalance detection** between racks
- Display of main **health and performance indicators** (Overview and Operation Dashboards)
- **Health analysis** tools (Health Dashboard)
- **Early warnings** between 1 and 30 days before expected failure (Maintenance Dashboard)
- Trouble shooting **instructions**



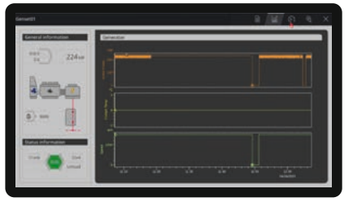


Benefits
- **Increased usable energy** with higher accuracy & lower imbalance
- **Increased system availability & safety** thanks to predictive maintenance
- **Battery insights** to performance and life expectation

CONSISTENT DATA HANDLING FROM SENSOR TO CLOUD...

mtu EnergetIQ | On-premise Automation and SCADA Solution.

- ***mtu*** EnergetIQ **Asset Controllers** & **Manager**
- **Hardware based** automation solution
- **Algorithms** and automated/manual **control**
- Local/remote **alarm and status** monitoring
- Customer **specific interfaces** and internet services
- Local **data storage**
- On-premise system **optimization &** battery **analytics**

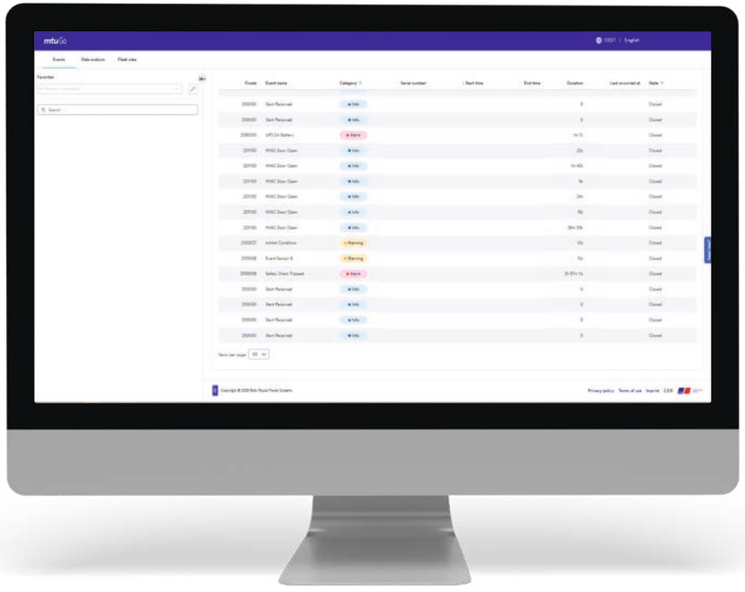


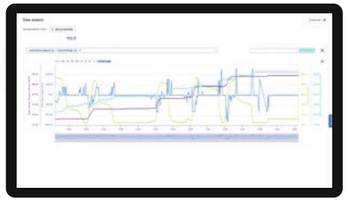
... FOR SIMPLIFIED DATA AND SERVICE MANAGEMENT

MAXIMUM DATA & CYBER SECURITY
Inhouse developed platform

mtu Go | Fleet wide Cloud Services.

- Corporate **cloud solution** across all ***mtu*** assets
- Fleet wide **alarm and status monitoring**
- Cloud **data storage**
- Flexible **data analysis** tools for trouble shooting
- Integration with Rolls-Royce **Remote Monitoring Center** (RMC)
- Integration with Rolls-Royce **service processes**
- Enabling **reports** as part of our service solutions





WE HANDLE IT ALL—FROM BREAKING GROUND TO THE FINAL MEGAWATT!

Rolls-Royce is your end-to end partner throughout the entire project life-cycle.[1]

Conceptual Design

- Feasibility studies, project consulting, and load/ degradation analysis
- Component sizing, system design, and regulatory compliance
- Cost analysis and financing support

Approval Planning & Detailed Design

- Site layout, infrastructure planning, and system architecture
- Electrical, risk & safety engineering (fire, noise, HAZOP/HAZID), and compliance
- Component selection, specifications, and grid integration

Procurement & Logistics

- End-to-end procurement, logistics, and regulatory compliance
- EPC oversight, contractor coordination, and on-site supervision
- HSE management and safety compliance

Installation, Construction & Commissioning

- Foundations, infrastructure (cabling, drainage, roads), and site access
- Perimeter security, BESS, and balance of plant installation
- Grid connection, commissioning, testing, on-site training, and handover

Operation & Maintenance

- Long-term service agreements (LTSAs), monitoring, diagnostics, and optimization
- Remote monitoring center (RMC) and warranty extensions
- Flexible augmentation options for performance improvement

[1]Exemplary lists of services and deliverables—non exhaustive!

SECURING ENERGY INVESTMENTS WITH SERVICE SOLUTIONS

mtu EnergyPacks are built to deliver the highest performance with low lifecycle costs. We help you keep them performing that way with a full portfolio of service solutions.

Remote operation control and diagnostics, digital connectivity solutions and innovative maintenance approaches keep the lifecycle costs of the ***mtu*** EnergyPack to a minimum. With constant remote monitoring, a worldwide network of service partners and a sound spare parts concept, we ensure your systems stay up and running, wherever in the world they are located. Customers can have the benefit of peace-of-mind provided by performance guarantee agreements which promise specific levels of up-time and can be tailored to fit your specific requirements.

Our services include preventive, predictive and corrective maintenance, performance guarantees, and real-time system monitoring, ensuring dependable return on investment.

Adapt to the evolving energy landscape with advanced upgrades, augmentation services, and digital solutions for remote monitoring, management, and optimization. Our offerings ensure your BESS is ready for future energy demands.

Continuous, reliable operation is essential for BESS efficiency. Our proactive preventive maintenance prevents disruptions, ensures peak performance and reduces operational risks. Opting for an ***mtu*** EnergyPack with a long-term service agreement means that you invest in a stable and secure energy solution.

Our performance guarantees reflect our conviction that our service secures your investment value. Our sophisticated connectivity solution is the base for our constant remote monitoring to ensure that we react fast if deviations occur. If that happens, Rolls-Royce relies on a strong sales and service platform across the world.

Key benefits:

- **Performance Guarantee:** We ensure your investment is protected, delivering consistent, optimal performance for your BESS plant
- **Financial Attractiveness:** Enhance project bankability through maximized cost-efficiency, effective CAPEX allocation, and optimized OPEX
- **Clear Data Insights:** Gain comprehensive visibility into system health with continuous data tracking and insights
- **Reliable Solution Partner:** Dependable support and expertise to ensure smooth, efficient BESS operation

1,200 locations

180 countries

>350 service partners

24/7 customer access

BESS TRACK RECORD

Our expertise and experience have enabled us to achieve a proud track record and to continuously improve product performance.

6	45	>635 MWh	>150
CONTINENTS	COUNTRIES	INSTALLED	PROJECTS

Featured Projects

***mtu* EnergyPack QG**
16 x CATL EnerC+
8 x Power Electronics PCS
32.6 MW / 65.2 MWh

Customer: Battery Park Zeewolde
Location: Netherlands

***mtu* EnergyPack QG**
168 x CATL EnerOne
30.7 MW / 62.6 MWh

Customer: Semper Power
Location: Netherlands

***mtu* EnergyPack QG**
49 x CATL EnerC+
33 x SMA PCS
80 MW / 160 MWh

Customer: AST
Location: Latvia

***mtu* EnergyPack QG**
24 x CATL EnerOne
4.4 MW / 68.9 MWh

Customer: Abo Wind
Location: Germany

DO YOU NEED SUPPORT?

Your All-in-One Energy Solution
From design to operation, we deliver a fully integrated energy storage solution with MV/HV integration for seamless performance.
- Planning & Design—Feasibility analysis, permitting support & optimized system integration
- Execution—Procurement, installation & commissioning (incl. MV/HV scope)
- Operation—LTSAs, warranty extensions & performance optimization
- Sustainability—Battery recycling & responsible disposal

Expert Support at Every Stage
Our specialists work closely with you to design a solution that meets your goals and maximizes your site's performance.

Ready to optimize your energy storage solution?

Contact us today to get started!
www.mtu-solutions.com/references

Subject to change. | Edition 01/25 | BMC 2025-05 | Printed in Germany on chlorine-free bleached paper.

Follow us for our latest news
and energy solutions: @mtusolutions

Rolls-Royce Group
www.mtu-solutions.com

The Rolls-Royce name, Rolls-Royce badge and Rolls-Royce monogram logos are registered Trade Marks of Rolls-Royce plc