



Rolls-Royce mtu EnergyPack

# The BESS advantage: powering a more sustainable and resilient energy system in Lithuania

As Europe reinforces its commitment to decarbonisation, energy storage has emerged as one of the continent's most strategic assets. Nowhere is this more evident than in the Baltic States, where significant geopolitical challenges highlight the need for renewable integration, energy security and grid resilience.



the largest BESS infrastructures in the Baltic region.

The objective of the project goes far beyond storing surplus renewable energy during periods of low demand and releasing it at peak times. At a deeper level, the combined efforts of the organisations involved aim to enhance the Lithuanian grid's ability to respond to frequency deviations, voltage instability and sudden fluctuations caused by the intermittent nature of wind and solar generation.

### The power unit: a critical layer often overlooked

The ability to charge, discharge, modulate and stabilise grid conditions depends heavily on the supporting electrical systems. Nidec Conversion's power units perform this function through a compact, skid mounted configuration that unifies three major components: Power Conversion System (PCS), integrated transformer and medium voltage switchgear.

The PCS enables bi-directional energy flow between batteries (DC) and the transmission grid (AC). Its design affects a range of factors critical for high performance, including conversion efficiency, the ability to respond to rapid frequency changes, contribution to system inertia, voltage regulation and compliance with stringent European grid codes.

As renewable penetration increases, these capabilities are becoming non-negotiable. Traditional power plants provide inertia, meaning resistance to sudden frequency changes, through rotating mass. As fossil fuel units retire, new solutions are required to replicate these stabilising characteristics. Currently, the PCS is one of the few technologies available capable of fulfilling this role in inverter based systems.

The transformer, for its part, elevates battery output to medium voltage grid levels. Its engineering must withstand fast cycling, significant thermal variation and continuous interaction with power electronics, conditions that differ markedly from those of conventional transformer applications.

Finally, the medium voltage switchgear ensures that BESS can safely connect and disconnect from the grid, maintain protection selectivity and isolate faults. It is also instrumental in facilitating operational flexibility, enabling different modes of operation and rapid response when system disturbances occur.

The synergy of these three elements within a unified skid minimises the complexity of utility-scale deployments. While faster installation, streamlined commissioning and reduced site footprint all contribute to improved efficiency, the greatest impact lies in the consistency and quality of grid interaction.

Led by Ignitis Group and integrated by Rolls-Royce's Power Systems division, Lithuania's latest milestone, a 291 MW / 582 MWh Battery Energy Storage System (BESS) project, stands out as a landmark initiative aiming to strengthen the country's security while advancing the green transition.

At the centre of this complex and ambitious infrastructure programme is Nidec Conversion, whose power units serve as the grid facing core of the storage system. The company's integrated units, which combine Power Conversion System (PCS), transformer, and medium voltage switchgear, provide the essential interface that controls battery discharge, ensuring the process is safe, reliable and functional to grid stability.

With energy security becoming a top priority and renewable penetration rapidly increasing, such technology plays a pivotal role in serving national interests.

### A national effort to reinforce the Baltic grid

Due to rising geopolitical tensions across the world, including in the Baltic region, Lithuania's drive for energy independence has accelerated over the past decade, culminating in a strategy that prioritises the extensive implementation of renewable energy, cross border interconnections and domestic balancing assets.

In the second half of 2025, Ignitis Group, a renewables' focused integrated utility and the largest listed company in the Baltic States, selected Rolls-Royce's Power Systems division to provide large-scale battery storage systems from the mtu EnergyPack brand, including the control system, mtu EnergetIQ Manager, for three key locations: Kelmė and Mžeikiai wind farms, and the area surrounding the Kruonis Pumped Storage Hydroelectric Power Plant.

Expected to be fully operational by 2027, these installations, together, will create one of



Example of a Power Unit from Nidec Conversion

**The growing importance of grid forming capability in modern power systems**

Grid forming capability is one of the main emerging technical needs in high renewable power systems. Traditional inverters are grid following, as they synchronise with the existing grid structure and inject power accordingly. Grid forming inverters, by contrast, create and maintain a stable voltage and frequency reference, effectively 'forming' part of the grid's backbone. Nidec Conversion's Power Units are designed to achieve just this.

Grid forming capabilities are particularly important in Lithuania. While the country is connected to European networks, it has historically operated with limited synchronous inertia.

With a growing share of wind and solar energy in the mix, the system increasingly depends on fast acting resources to maintain frequency stability during disturbances, provide synthetic inertia to compensate for declining rotating mass and manage system islands and black start scenarios. Support for microgrids, or partially disconnected regions, and maintenance of voltage quality under varying load conditions are other key factors to consider.

By capitalising on grid forming capabilities, BESS systems can behave like classical synchronous generators, delivering a much needed stabilising effect in the Baltic region's evolving energy landscape.

Stemming from decades of experience in industrial power electronics, Nidec Conversion's PCS effectively supports grid forming solutions through an array of features, ranging from virtual synchronous machine (VSM) behaviour and inertial and primary frequency response to enhanced voltage control and black start capabilities.

These cutting-edge systems equip operators with sophisticated tools that, until recently, were unavailable in inverter dominated environments. In the Lithuanian BESS programme, such features are paramount to achieving the resilience objectives set by the country.

**Achieving reliability in demanding operating environments**

Due to its wide variations in temperature and occasional extreme winter conditions, Lithuania's climate places significant pressure on outdoor electrical infrastructure. Grid fluctuations connected to variable renewable generation compound these stresses, requiring hardware built for endurance.

Nidec Conversion's systems draw on a design lineage developed for industrial automation, marine propulsion and heavy duty power quality equipment, all areas where reliability is of the essence. The company's heritage translates into robust thermal management, components designed for continuous cycling, strong electromagnetic compatibility (EMC) performance, protection systems engineered for fast fault detection and long-term operational stability under any kind of grid conditions.

This, in turn, leads to fewer outages and emergency maintenance events, as well as to improved lifetime performance, all critical elements when it comes to projects expected to operate for decades.

**A multilayered collaboration for a new type of grid**

No organisation, on its own, can master every layer of today's grid transformation. To thrive in modern energy systems, collaboration is of the utmost importance, as the BESS project in Lithuania well exemplifies.

Ignitis Group provides strategic direction and leadership in grid integration. Rolls-Royce's Power Systems division supplies large-scale

battery storage systems and control systems. An important component of the Rolls-Royce solution is the mtu EnergetIQ Manager, which was developed in-house and is tailored to the company's battery systems. This intelligent control system not only manages the three battery parks, but also the connected wind farms and controls both power supply and storage.

Nidec Conversion, for its part, delivers crucial power electronics and grid interface technology.

Not only does this integrated approach accelerate deployment, but it also ensures that each layer, from battery chemistry to transmission level operation, is handled by professionals highly skilled in their respective areas of expertise.

**Toward 2027: shaping a more stable, sustainable and resilient grid**

When fully operational, the 291 MW / 582 MWh BESS installations will do more than storing energy. They will stabilise frequency and voltage, support renewable integration and reduce curtailment of wind and solar. By improving resilience during grid disturbances and providing grid forming capability, they will also enhance security of supply.

Nidec Conversion's Power Units act as the technical interface that makes these outcomes possible. By combining power conversion, transformation, protection and advanced system forming capability, they will help Lithuania move confidently toward a low carbon future, while strengthening its national security.

In the long term, the technologies deployed in Lithuania may serve as a blueprint for managing the fluctuations typical of renewables. The role of efficient and reliable Power Conversion Systems like those supplied by Nidec Conversion will be at the heart of Europe's transition to next generation grids.

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