Nidec

All for dreams

Battery Energy Storage Systems

Nidec – a global force

NIDEC IS A $15BN USD MULTINATIONAL WITH OVER 200,000 EMPLOYEES FOCUSED ON “EVERYTHING THAT SPINS AND MOVES”.

Listed on the Tokyo Stock Exchange since 1998.

In 2013, Nidec group purchased Ansaldo Sistemi Industriali, an Italian multinational with over a century of experience in the design and manufacture of power electronics, motors and generators and automation systems for industrial applications thus entering the rapidly evolving energy sector with a focus on solutions that are transforming the industry, including Energy Storage. Nidec also owns the following industrial brands: US Motors, KatoEngineering, Leroy Somer, Control Techniques and SSB Wind Systems.

With over 800MWh in operation across the globe in more than 60 projects, Nidec is one of the world’s leading providers of large scale energy storage solutions. Whether you are investing in Primary Frequency Regulation, Power Balancing, Peak Shaving, Peak Shifting or Microgrid applications we have the right solution to fit your needs.

#1 in Europe.

Ranked in top 3 for Utility Scale BESS Globally.

The extraordinary value of experience

OUR COMPONENTS AND SYSTEMS OFFER SAFE, RELIABLE PERFORMANCE OVER THEIR ENTIRE LIFETIME BACKED BY NEARLY A CENTURY OF EXPERIENCE IN THE DESIGN, MANUFACTURE AND SUPPLY OF ELECTRICAL SYSTEMS. OUR EXPERTISE IN POWER CONVERSION, POWER MANAGEMENT AND POWER QUALITY IS YOUR KEY TO A SUCCESSFUL PROJECT.

POWER CONVERSION
Our Power Conversion Systems are designed and built in-house using the same components of our industrial product line, which means spare parts and upgrades will be available for the life of the equipment. Rugged and robust, these products have a proven track record for performance and efficiency.

POWER MANAGEMENT
ARTICS Smart Energy is our proprietary, real-time integrated Power and Energy Management System which operates on standard hardware platforms. With a vast library of functions, the system can quickly be configured to your plant's requirements. Based on our industrial platform it is a tried and true solution used in thousands of plants across the globe and can be seamlessly integrated with third party arbitrage or supervisory software.

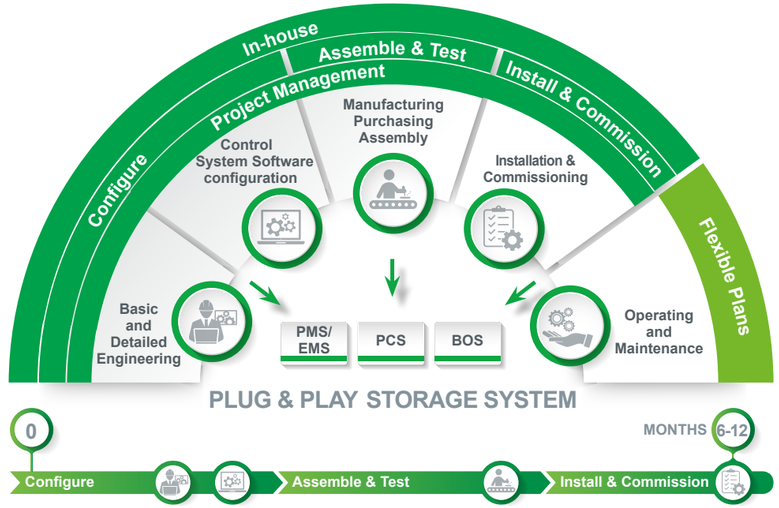
POWER QUALITY
Nidec is a leading supplier of Power Quality solutions including StaticVar, D-Statcom and Statcom for industrial and grid applications. Our in-depth knowledge of power quality has allowed us to develop algorithms that optimize energy flows from and to the grid to ensure optimal voltage and frequency regulation, mitigating any risk of grid failure and prolong battery life.

NIDEC acts as a turn-key system supplier or electrical partner to suit your needs. Our systems are fully manufactured in-house using our proprietary power conversion systems and our own power management system for a truly integrated solution.

HASSLE-FREE PROJECTS IN THREE SIMPLE STEPS

Nidec takes a partnership approach with customers and ensures that the experience of working with us is always positive. Our expert engineering and project management team has fine-tuned our process into three simple steps:

- **Configure**
- **Assemble & Test**
- **Install & Commission**



PRIMARY MANUFACTURING LOCATIONS FOR ENERGY STORAGE:

FRANCE

Located in central France, our Roche-la-Moliere facility is the global center of Excellence for Energy Storage Systems with global responsibility for the development of our Power and Energy Management System (PEMS), ARTICS Smart Energy. Our team works closely with research institutes and battery manufacturers to develop the state-of-the-art algorithms that make our PEMS best in class.

ITALY

Located in northern Italy, our Milan facility is the global center of Excellence for Power Electronics. Our Power Conversion Systems are designed, developed and manufactured based on our more than 100 years of experience in the manufacturing of power electronics for heavy industrial applications.

USA

Nidec Group expanded its US. operations with the opening of a facility in Cleveland (Ohio). The state-of-the-art facility features a purpose-built area for the assembly and testing of extensive industrial controls and automation systems, Battery Energy Storage Systems (BESS), and Medium Voltage Drives, along with a cutting-edge production area for Nidec's Avtron Encoders.

INDIA

The factory in Chennai is the newest addition to our expanding energy storage capabilities for manufacturing and system integration. The facility manufactures LV drives and systems for industrial and energy applications for the Indian market.

Configure a safe investment

THE BENEFITS OF BESS

BESS technology helps improve energy flow at every stage of the energy transmission chain. It can reduce generation costs, managing and flattening the load profile and consequently avoid/postpone grid upgrades and/or the need for additional peaker stations. Furthermore, energy from renewable sources can be integrated with BESS to optimize the plant's generation profile to either obtain a flat profile or store excess production to release later when required. Moreover, BESS makes the grid smarter and capable of using electrical power at the grid level when it is most needed. At the end-user level, for Industrial applications, BESS provides a reliable energy source for specific loads to proactively compensate for voltage flickers and short power outages (an alternative form of power quality), thus avoiding any production outages due to a grid fault. Management of production peaks is also a suitable application, offsetting the need to upgrade the factory grid.

SYSTEM COMPOSITION

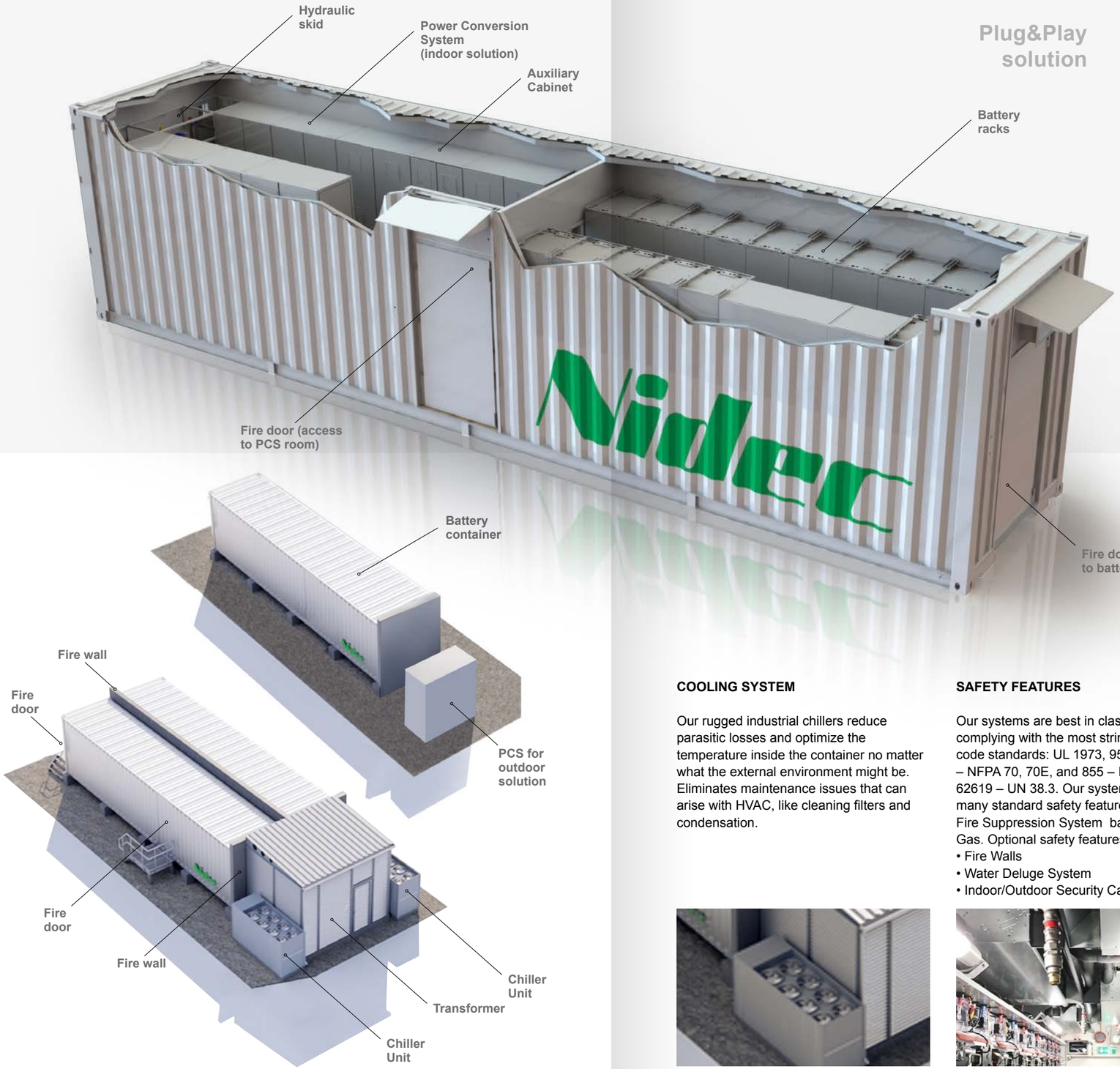
The BESS Unit consists of batteries, a power and energy management system, power conversions systems based on active front end inverter technology, along with transformers, cooling system and protective circuit devices. Batteries can be configured in modules of up to several megawatts for use in various applications with different battery topologies according to performance requirements.
Nidec provides robust, modular solutions based on proven industrial technology that minimizes installation and maintenance times, prolongs system life and enhances safety.

CONFIGURATIONS & COMPLIANCE

Nidec offers several standard configurations including
- The Cube: 1MW/1MWh in prefabricated concrete housing or metal cabinet
- The Mini-B: 20' container
- The Midi-B: 40' container
- The Maxi-B: 45' container
- The Jumbo-B: 53' container.

Containers are available as walk-in units or external access only.

Systems are compliant with international grid codes. IEC standards, UL 1741 SA, IEEE 1547, and others.



COOLING SYSTEM

Our rugged industrial chillers reduce parasitic losses and optimize the temperature inside the container no matter what the external environment might be. Eliminates maintenance issues that can arise with HVAC, like cleaning filters and condensation.

SAFETY FEATURES

Our systems are best in class for safety complying with the most stringent safety code standards: UL 1973, 9540, and 9540A – NFPA 70, 70E, and 855 – IEC 60529 and 62619 – UN 38.3. Our systems incorporate many standard safety features such as a Fire Suppression System based on Inert Gas. Optional safety features include:
- Fire Walls
- Water Deluge System
- Indoor/Outdoor Security Cameras.

POWER CONVERSION SYSTEM (PCS)

Indoor and Outdoor Solutions: Nidec provides the following PCSs.

AD5000 (690V)
Indoor for cabinet solution, used for commerial and industrial BESS and microgrids.

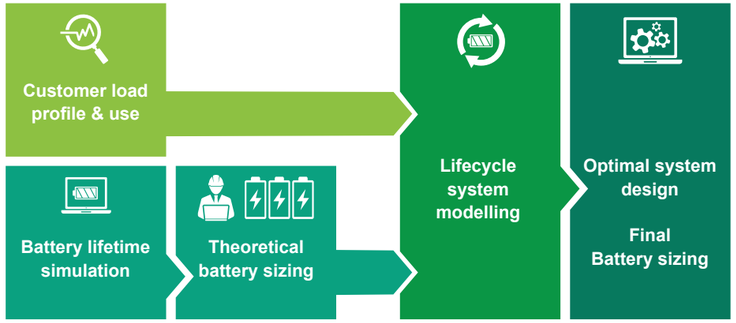
ES690 (690V)
Indoor for containerized solutions. Used for commercial, industrial, utility scale applications and microgrids.

ES1000 (1000V)
Indoor/outdoor solutions for utility scale applications.

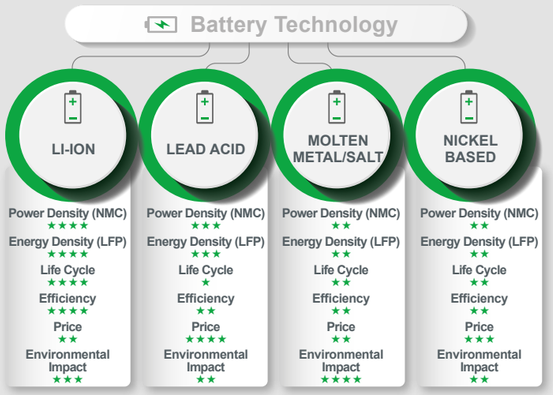
ES1500 (1500V)
Outdoor solution. Single hybrid inverter to manage both PV+BESS.

Battery sizing and ARTICS Smart Energy

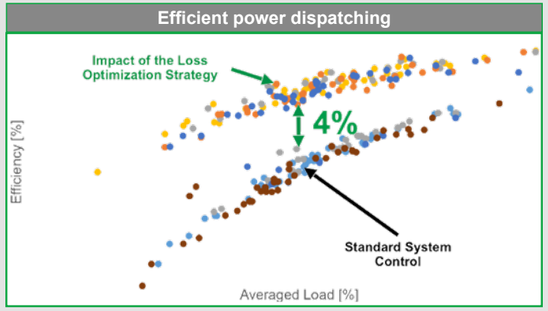
BATTERY SIZING IS ONE OF THE MOST CRITICAL STEPS IN DEVELOPING THE OPTIMAL BESS SYSTEM. AT NIDEC WE HAVE DEVELOPED AN ADVANCED LIFECYCLE SYSTEM MODELLING TOOL THAT ALLOWS US TO TAKE THE USER'S LOAD PROFILE AND THE BATTERY MANUFACTURER'S THEORETICAL LIFE CYCLE AND RUN A SIMULATION OF HOW THE BATTERIES WILL ACTUALLY PERFORM TO DETERMINE THE IDEAL BATTERY SIZING FOR THE APPLICATION.



Our systems are battery agnostic. Nidec has a vast experience in working with different types of batteries in various applications.



MINIMIZING THE LOSSES



- Testing over 300 Days
- Each point is a Day.
- In the standard control mode, the system is balancing the SOC of the batteries.
- The algorithms in our PMS are based on a "Loss Optimization Strategy" which grants chances to further reduce losses through optimized usage of our inverters.

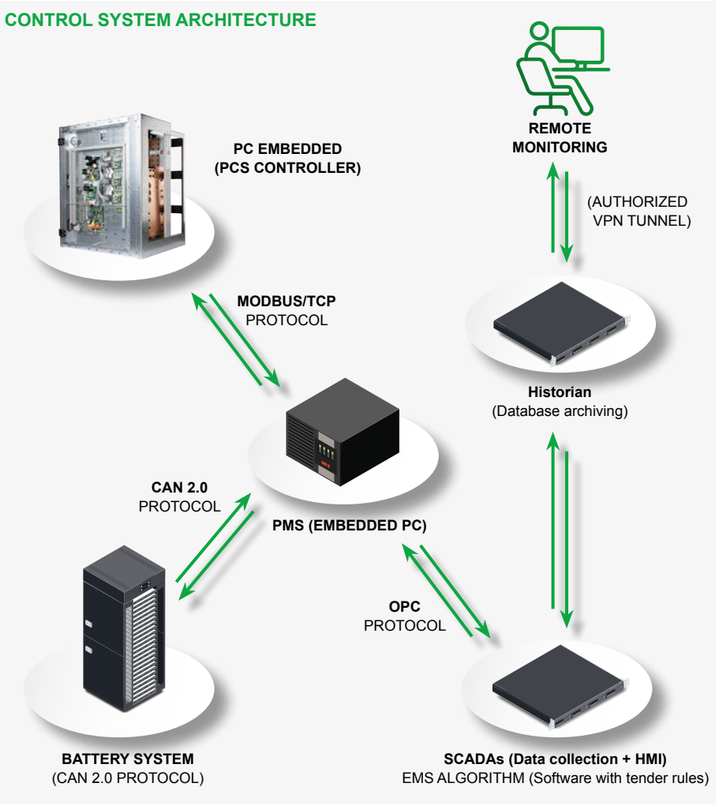
ARTICS SMART ENERGY

ARTICS SMART ENERGY is a configurable, open platform that offers maximum reliability based on our industrial automation suite used in more than 900 plants worldwide.

Key functions include:
- Power metering
- Historical data collection
- RES production prediction and management
- Forecast of energy profile for the next day
- Real-time control for loads and generators for grid stability and max RES production purposes
- Measure and analysis of the electric distribution system
- Emergency and protection management
- System Synchronization
- On-Grid & Off-Grid operations
- Monitoring and supervision system

The control system architecture is composed of the following "actors":
- BMS, Battery Management System;
- PCS controller;
- BESS Unit Distributed Controller;
- PMS, Power Management System (Centralized Controller);
- EMS, Energy Management System.

CONTROL SYSTEM ARCHITECTURE



Operation & Maintenance

NIDEC PROVIDES WARRANTIES WITH OPTIONAL LONG TERM OPERATION AND MAINTENANCE CONTRACTS FOR FULL LIFE CYCLE SUPPORT. OUR OPERATING AND MAINTENANCE PHILOSOPHY REPRESENTS OUR COMPANY'S GENERAL PARTNERSHIP APPROACH - THE SCOPE OF WORK CAN BE ADAPTED TO THE CUSTOMER'S NEEDS AND REQUIREMENTS.

Operation & Maintenance are an optional service that we can provide to Customers. This service can be tailored to our customer's specific needs.

Nidec is able to offer customers 24/7 remote plant operation control and monitoring, including reporting of site operation and performance data. As the plant operator, Nidec will manage scheduling for preventive and corrective maintenance programs as well as ensuring spare parts are always available and up to date. Plant performance reporting includes regular performance analysis with both monthly and annual status updates. Furthermore, Nidec can manage Customer invoicing to third parties. Yearly qualification testing can also be included in the contract.

Our maintenance programs include the following activities:

- First Level Intervention
- Preventive Maintenance
- Corrective Maintenance
- Hot Line Support, through a dedicated Help-Desk
- Remote Access Support.

Under Long Term contracts, Customers are expected to ensure that a minimum stock of spare parts are available on-site but these can be managed by Nidec.

Nidec can also provide technical training for the Customer's Plant personnel, including Corrective Maintenance, troubleshooting, and equipment repairs so that the Customer's Staff can repair the failure within the minimum possible time. Nidec offers various communication strategies to minimize eventual downtime periods including: Maximum Notification Period, 24h Desk Support, Remote Support (via authorized VPN tunnel), Single Call Procedure.

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INDUSTRIAL SOLUTIONS