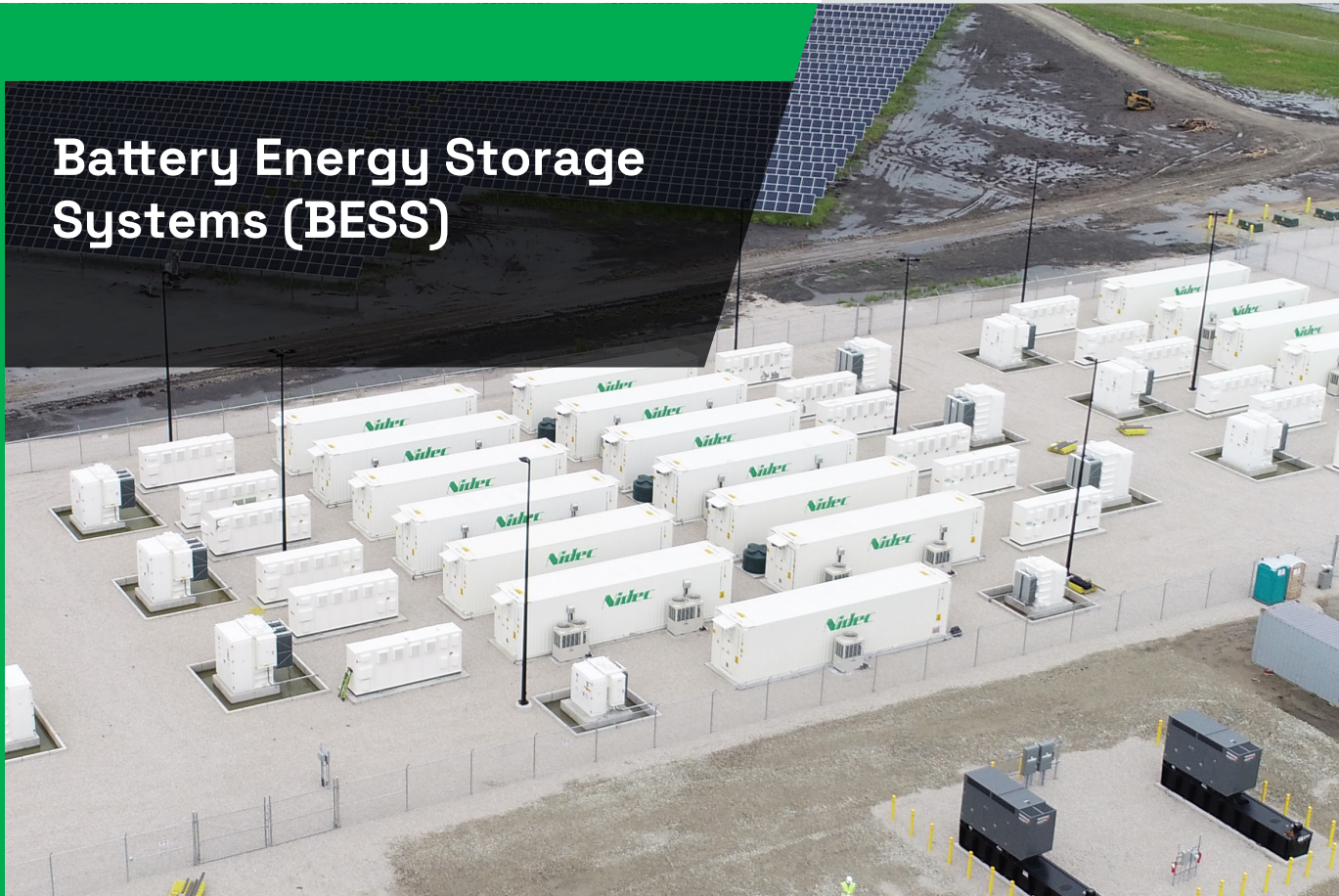


Battery Energy Storage Systems (BESS)





NIDEC - A GLOBAL FORCE

We are focused on converting Clean Energy into Power, we convert Clean Power into Motion, and we power the future, achieving a better and greener world for next generations, developing and manufacturing solutions that serve Energy, Mobility, and the Planet.

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 8GWh in operation across the globe in more than 147 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.

Primary manufacturing locations for Battery 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) as well as the design and construction of our containerized BESS solutions such as the all-in-one ACBOX and battery-only DC blocks.



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 USA 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.





THE EXTRAORDINARY VALUE OF EXPERIENCE



18
SERVICE CENTERS



9
MANUFACTURING SITES



3 GW
INSTALLED CAPACITY



8 GWh
IN OPERATION



147
PROJECTS



27
COUNTRIES

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

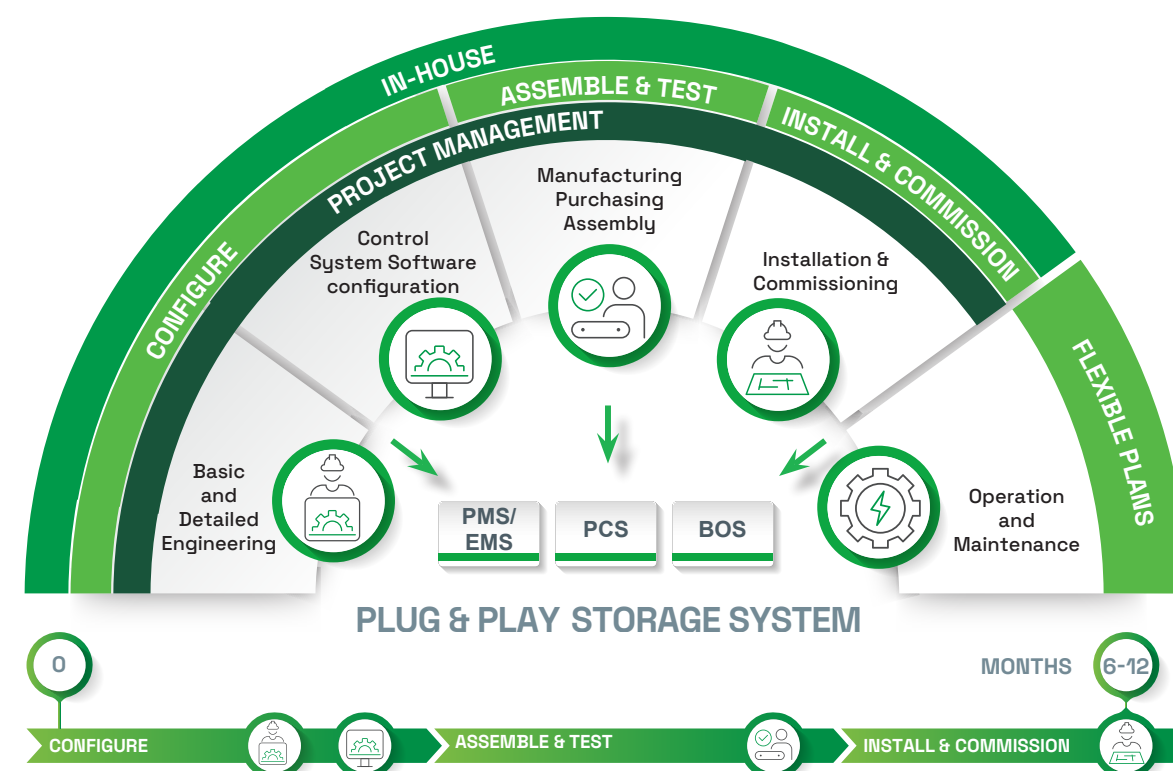
Nidec is a leading supplier of Power Quality solutions including StaticVar, D-Statcom and Statcom for industrial and grid applications. Our in-depth knowledge of power quality has allowed us to develop algorithms that optimize energy flows from and to the grid to ensure optimal voltage and frequency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



ACBOX Plug & Play Solutions

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.

SAFETY SYSTEMS

- Fire detection and extinction
- Deflagration panels
- Vents for gas expulsion

BATTERIES

- 20 Ft: up to 5.0 MWh
- 30 Ft: up to 6.6 MWh

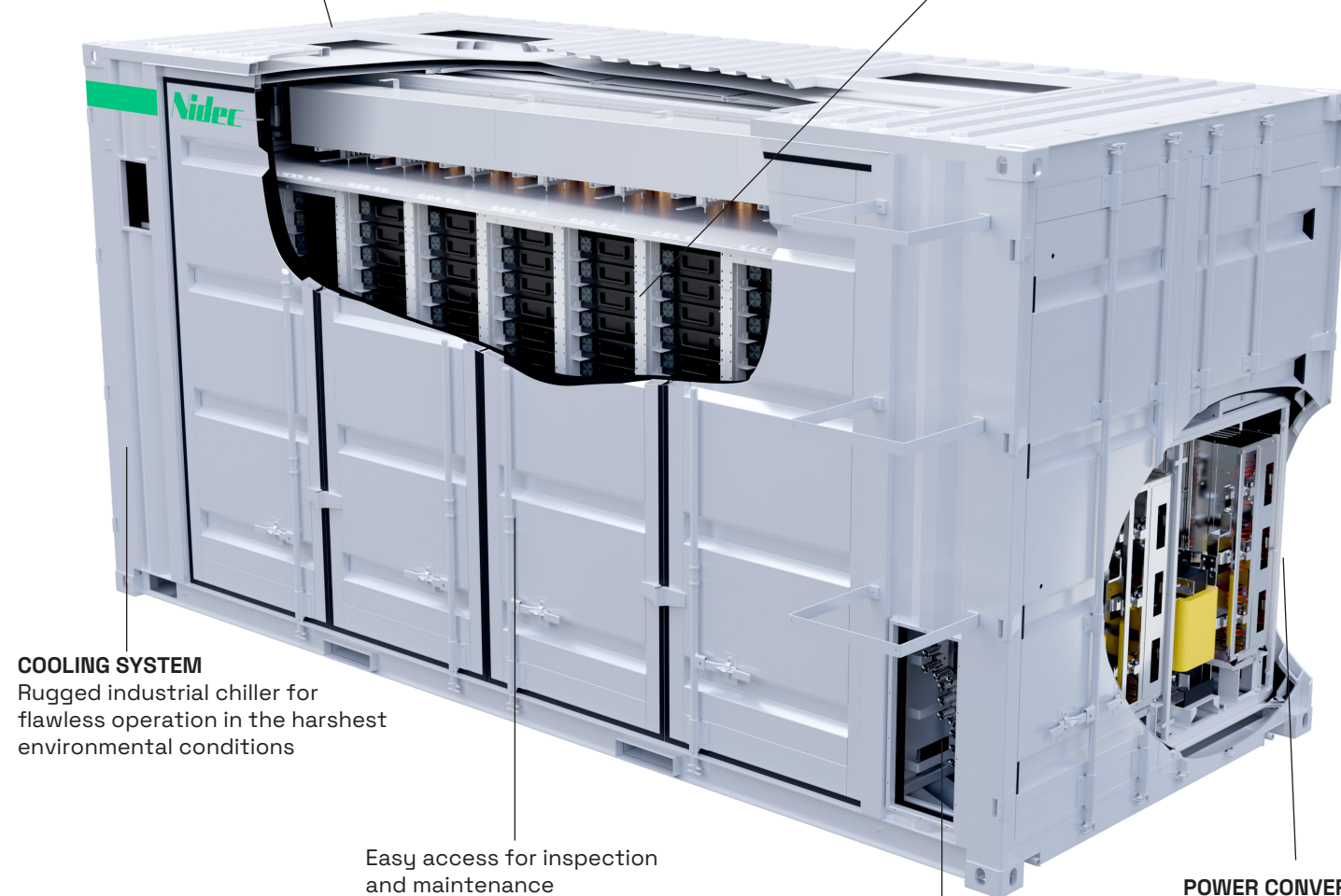
COOLING SYSTEM

Rugged industrial chiller for flawless operation in the harshest environmental conditions

Easy access for inspection and maintenance

AC port

POWER CONVERSION
up to 2.5 MVA



SYSTEM COMPOSITION

ACBOX units are a plug-and-play solution comprising batteries, 4-quadrant AC/DC power conversion, thermal management through an embedded water-cooling system, and state-of-the-art safety features.

ACBOX units are delivered in rugged 20 ft, 30 ft or 40 ft high-cube containers, ensuring maximum robustness and compatibility with the harshest environmental conditions. ACBOX units are complemented by an external

MV/LV transformer and MV switchgear also configured and supplied by Nidec for optimal performance. Seamless integration with Nidec Power and Energy Management Systems ensures maximum flexibility in meeting customer application demands and grid code requirements.

COOLING SYSTEM

Our rugged industrial chillers reduce parasitic losses and optimize the temperature inside the container no matter what the external environment might be. They also do away with 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.

POWER CONVERSION SYSTEMS (PCS)

Leveraging its extensive expertise in power electronics, Nidec developed 4-quadrant, water-cooled power conversion solutions compatible with batteries rated up to 1500 V.

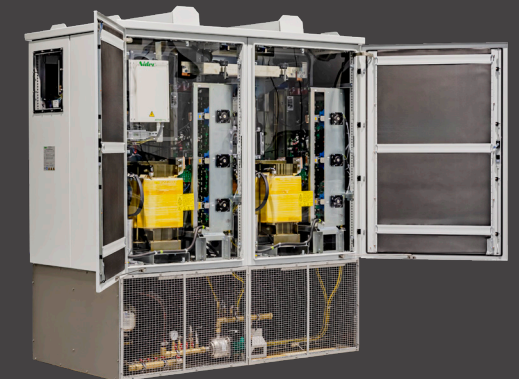
AD7000

3-level NPC water-cooled power module, powering ACBOX and ES1500 solutions



ES1500

Outdoor solution for long duration (4 hours to 8 hours) BESS applications



COMPLIANCE

Nidec Power Conversion Systems meet requirements by all major international standards:

- Safety: IEC 62109-1, -2, IEC 62477-1, UL 1741
- EMC: IEC 62920
- Grid Code: VDE-AR-N 4110, 4120, UL 1741 SA/SB, Terna Allegato A.79

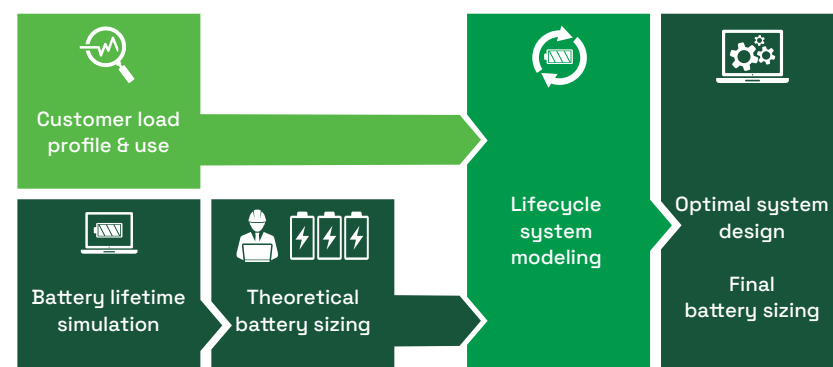
FUTURE-PROOF

Grid-connected grid forming operation with fault ride-through and synthetic inertia capabilities make Nidec Power Conversion Systems ready to support grids in the face of ever increasing penetration of non-programmable power generation

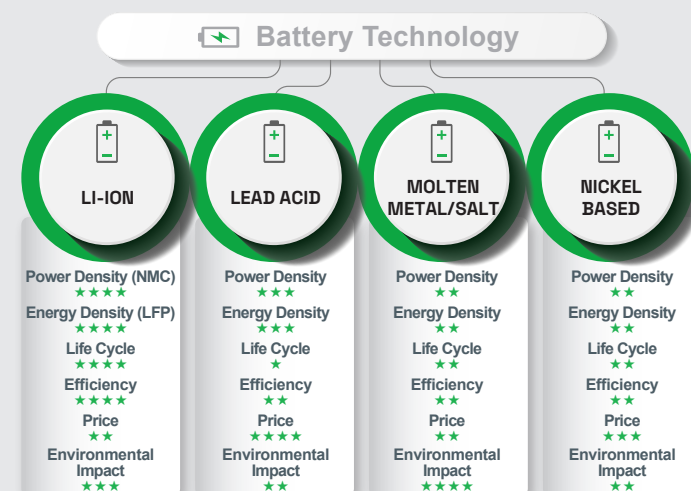


BATTERY SIZING AND ARTICS SMART ENERGY

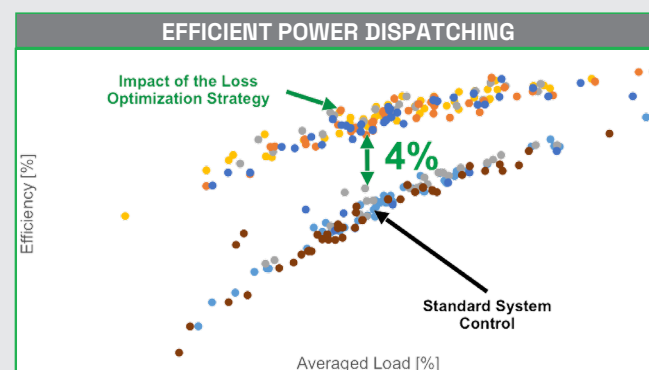
Battery sizing is one of the most critical steps in developing the optimal bess system. At nidec we have developed an advanced lifecycle system modeling tool that allows us to take the user's load profile and the battery manufacturer's theoretical life cycle and run a simulation of how the batteries will actually perform to determine the ideal battery sizing for the application.



Our systems are battery agnostic. Nidec has vast experience 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 is a configurable, open platform that offers maximum reliability based on our industrial automation suite used in more than 900 plants worldwide.

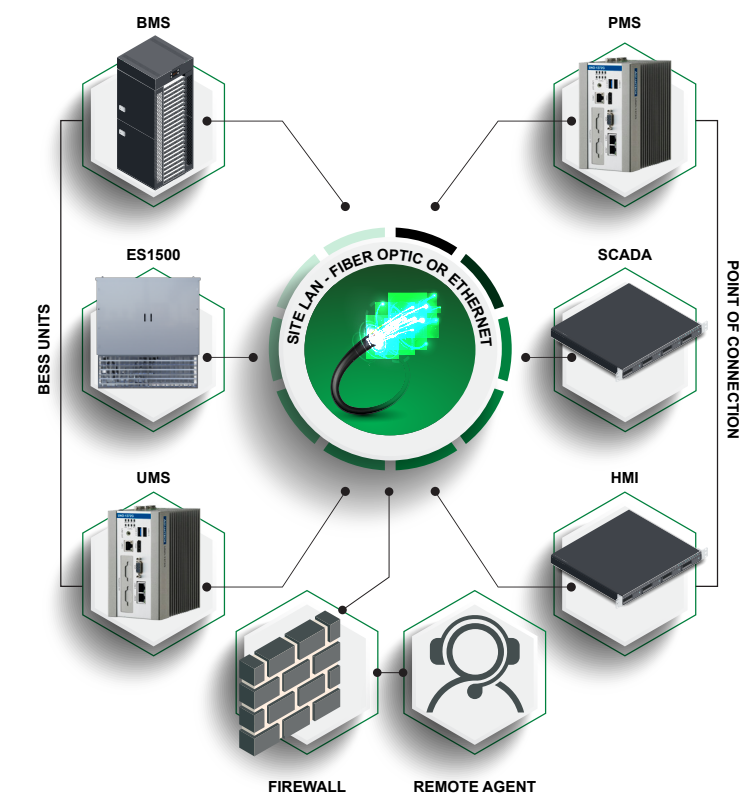
Key functions include:

- 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

Nidec portfolio includes a fully integrated control architecture collecting data from BMS on one end and interacting with the grid and TSO on the other, to deliver optimal battery performance and grid code compliance through a set of proprietary software solutions:

- Power Conversion System Control
- Unit Management System
- Power Management System
- Energy Management System
- SCADA and HMI

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.

