
INTRODUCING THE POWER-INTENSIVE ALTI-ESS SUITE



Creating more efficient, resilient and reliable electricity grids

Advanced energy storage technologies are helping transform the electricity grid to more effectively respond to changes in energy generation, utilization and policy. By delivering clean energy storage solutions that strengthen the efficiency, resiliency and reliability of the electricity grid, Altairnano is helping utilities and energy services companies achieve sustainable and economical power and energy management practices.

For example, Altairnano is helping independent system operators (ISOs) more effectively regulate the stability of the electricity grid, a process often referred to as frequency regulation. Today, utility and independent system operators respond to rapid and unexpected fluctuations in electricity generation and demand by continually ramping up or ramping down the production of conventional generation, such as gas-fired and diesel turbines.

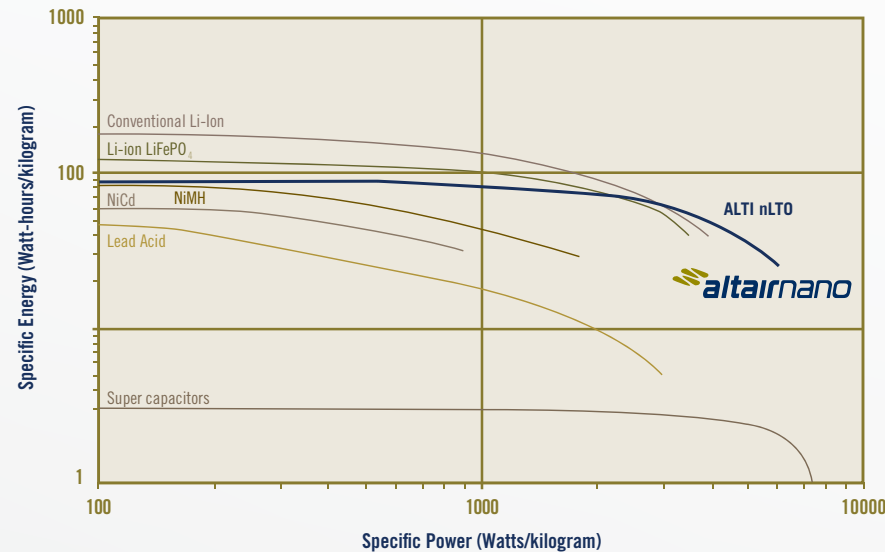
The Altairnano Energy Storage System is a cleaner and more energy efficient, as well as operationally efficient, system for managing grid stability. This system, known as the ALTI-ESS™ suite, is an adaptive, intelligent and scalable power and energy management platform.

It reduces dependencies on conventional carbon-based generation required for frequency regulation. Based on advanced lithium-titanate technologies, the ALTI-ESS responds within milliseconds to frequency fluctuations by releasing or absorbing power from the electricity grid. This helps improve equipment and capacity utilization, strengthen operational efficiencies and reduce carbon emissions.

And with a growing proportion of energy production being supplied by renewable generation, the demand for rapid and flexible power regulation capacity for grid stability will only increase. The ALTI-ESS reduces the need for backup conventional generation for maintaining grid stability associated with utility-scale renewable integration. Responding immediately to sudden shifts in generation, the ALTI-ESS releases or absorbs power from the electricity grid, and if needed, continues to release or absorb power until conventional generation is dispatched.

ONLY ALTAIRNANO ACHIEVES A 4C RATE AT THE EXTENDED CYCLE LIFE REQUIRED FOR GRID REGULATION

Altairnano's products have power delivery capabilities equal to a super capacitor, with significantly more energy storage than a super capacitor. Although competing technologies may perform at the required charge and discharge rates, they lack the extended cycle life required to deliver an economical solution.



ALTI-ESS benefits

EFFICIENT

Eighty-six percent total round-trip efficiency, including power conversion system, for a 1 MW dispatch, or 93% for a 250 kW dispatch. (Other energy storage systems have a round-trip efficiency between 60 to 80 percent.) The ALTI-ESS uses less energy to achieve the same charge/discharge results when compared to other energy storage devices, including traditional lithium-ion.

RESPONSIVE

The ALTI-ESS has the highest charge rate of any lithium-ion energy storage device. Featuring a powerful 4C rate, it can receive a dispatch signal and respond with required power and energy outputs in milliseconds.

LONG LIFE

With a 12,000+ cycle life and a 15-year calendar life, Altairnano's advanced lithium-ion cells and battery systems ensure power is available when it's needed the most.

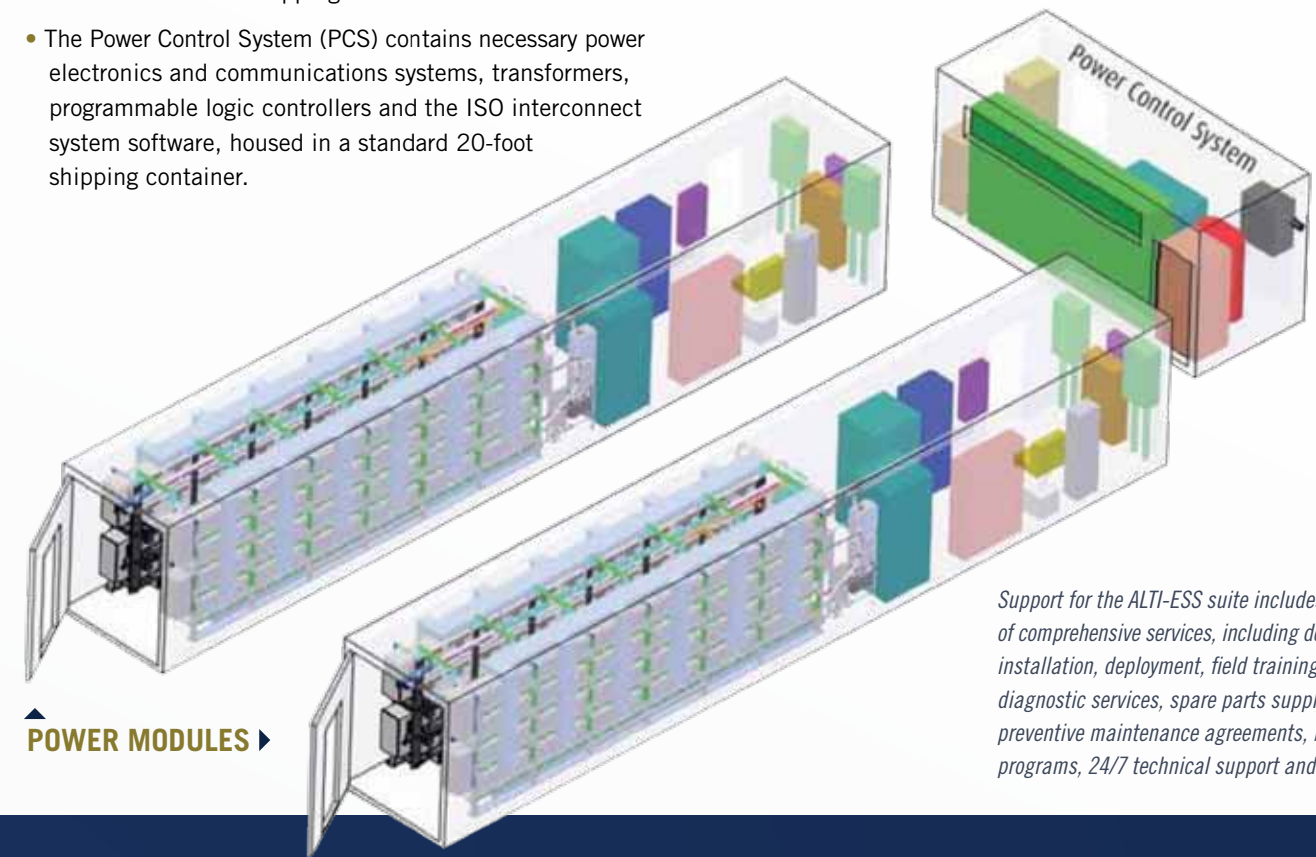
Modular system designed for pure power

The use of nanostructured lithium-titanate in Altairnano's cell technology produces distinctive performance attributes, including extremely fast charge and discharge rates, the industry's highest round-trip efficiencies, long cycle life, safety and the ability to operate under diverse environmental and temperature conditions. These unique performance attributes make the ALTI-ESS ideally suited for power-dependent applications.

Altairnano provides a fully integrated system easily interconnected to the utility grid.

The ALTI-ESS consists of a modular system design, including the following components:

- The Power Module consists of a 1 x 1.0 MW battery pack and Battery Management System (BMS), fire suppression equipment and thermal-management system, housed in a standard 53-foot shipping container.
- The Power Control System (PCS) contains necessary power electronics and communications systems, transformers, programmable logic controllers and the ISO interconnect system software, housed in a standard 20-foot shipping container.



Support for the ALTI-ESS suite includes a complete package of comprehensive services, including design, manufacturing, installation, deployment, field training, remote monitoring, diagnostic services, spare parts supply, on-site service, preventive maintenance agreements, battery replacement programs, 24/7 technical support and end-of-life handling.

POWERFUL

With a maximum continuous discharge of 1,400 amperes, the ALTI-ESS is the solution for power-dependent applications.

SCALABLE

Based on the 1MW/250kWh component configuration, the ALTI-ESS can be scaled to virtually any multi-MW power and energy capacity. This ensures the right balance of power to energy is matched to meet application requirements.

KEMA validates potential for utility applications

KEMA, an independent consulting firm providing testing and validation for the utility and energy sectors, verified Altairnano's fast response and more than 90 percent round-trip efficiency.

"Well suited for scalable regulation applications based on a rapidly changing power dispatch"

"Successfully demonstrated the potential of using the new battery technology for utility applications"

Read the KEMA report at www.altairnano.com



REDEPLOYABLE

The ALTI-ESS is modular, allowing for quick field deployment or later relocation as needs and requirements change.

COMPREHENSIVE

Scalable 1 MW/250 kWh battery configurations, including battery management system, solid-state inverter, power electronics, programmable logic controllers and interconnect system software for grid connectivity, plus a package of support services.

Your Needs

Altairnano is helping companies respond to a number of challenges and opportunities within today's energy markets and emerging smart grid energy storage applications, including:

- **FREQUENCY REGULATION**
- **RENEWABLE INTEGRATION**
- **DISPATCHABLE DEMAND RESPONSE**
- **ANCILLARY SERVICES**
- **DISTRIBUTED ENERGY STORAGE**



Technical specifications

AC Voltage	480 VAC.
Power Rating	3.6 MW / 4 MVA
Energy Content	367 kWh
Response Time + 1MW to – 1MW	< 100 milliseconds
Operating Temperature	Factory designed standard range -10°C to 50°C Extended range available to -40°C and 55°C
Storage Temperature	-40°C and 55°C
Elevation Requirements	Up to 5,000 ft. above sea level
Standard Configuration	Frequency 60 Hz Nominal
50 Hz Capable, Including Auxiliary Loads	50 Hz Capable, Including Auxiliary Loads
Voltage Operating Range	As defined by ANSI C84.1 and IEEE 1547
Round-trip Efficiency	86 percent to 92 percent

The ALTI-ESS suite is compliant with the following standards: IEEE 1547, IEEE 1547.1, IEEE 519, IEEE 979, IEEE C62.41.2-2002, IEEE 693-2005, UL 1741, ANSI C51.110-1986, ANSI C84.1, NFPA 70, NEC Article 480, ANSI/IEEE C2-2007, OSHA 1926.441 and FCC Title 47 part 15 Class A.

*For more information about the **ALTI-ESS** suite and other solutions,
call **+1.775.856.2500** or email **sales@altairnano.com***

NEVADA

204 Edison Way
Reno, Nevada 89502
+1.775.856.2500

INDIANA

3019 Enterprise Drive
Anderson, Indiana 46013
+1.317.333.7617



Current as of 3.7.2012

Note that all specifications, product descriptions, standards and other technical documentation are subject to change at any time and cannot be guaranteed accurate as of this printing. 2012 by Altairnano. Altair Nanotechnologies Inc.® and Altairnano® are registered trademarks of Altair Nanotechnologies Inc.