

GE Energy Storage



# Durathon\* Batteries

Battery Power, Reimagined



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## Battery Power, Reimagined

Introducing GE's Durathon Batteries and Energy Storage Systems, another milestone in our long heritage of solving the world's toughest challenges through innovation. The Durathon Battery's sodium nickel chemistry represents a quantum leap forward: what started as a simple pursuit of a better battery has produced a safer, high-performance energy storage solution that is extremely durable and reliable. Durathon Energy Storage Solutions will change the way the world sees battery power.

Durathon Batteries are a product of Ecomagination, embodying GE's commitment to imagine and build innovative solutions to address today's environmental challenges while driving economic growth. Through constant development and innovation, we can design and deliver substantial business and environmental performance.



### Safety

Durathon Battery's safety design features and protective controls in the battery management system guard against failure modes common to industrial batteries due to misuse, damage or other external factors.



### Long Service Life

Durathon Batteries are designed for continued daily cycle performance over extended periods of time, enabling a high-energy throughput over the life of the battery. Durathon technology can run over 3,500 cycles at deep depth-of-discharge (80% DOD) and features a virtually unlimited shelf life since they do not self-discharge.



### Temperature Independent

Durathon technology is suitable to operate in extreme ambient temperatures without adversely affecting energy delivery, life cycle and safety. Capable of operating at temperatures ranging from -40°C to 65°C, Durathon Batteries do not require the use of air conditioning or heating.



### Minimal Maintenance

Durathon Batteries require minimal on-site maintenance. Each module has a battery management system that monitors the battery's condition and allows for remote monitoring and diagnostics enabling significant reduction in battery operating costs.



### Environmentally Responsible

Durathon Batteries, a product of Ecomagination, are fabricated from abundantly available raw materials and can be recycled through the GE-authorized recycling partners at the end of the battery's service life, reducing industrial waste.



### High Reliability

Durathon systems are engineered to maintain power. Individual battery modules have a battery management system designed to optimize battery life and performance, protect against destructive conditions, and enable remote monitoring and diagnostics.



### Smaller Footprint

With best-in-class energy density, Durathon Batteries offer more energy in half the space and one-third the weight of an equivalent wet-cell, lead-acid battery.



### Scalable

A modular design allows for customization – acting as building blocks, Durathon Batteries can be aggregated into multiples of hundred-kilowatt-hour-sized or megawatt-hour-sized energy storage units that integrate into energy management control systems.



### Seamless Integration

Designed to communicate with standard energy management systems, each Durathon Battery module easily integrates into any pre-existing, system-wide control software.

# Durathon Batteries

## Powering the Future, Empowering the World.

With the introduction of Durathon Battery technology, GE is establishing a new generation of technological advancements to improve the quality of life across the globe. A battery innovation for the modern age, Durathon Batteries form the basis for a safer, reliable and high-performance energy storage system. This battery energy storage system improves the efficiencies of a variety of applications through its high-energy density and superior cycle performance across a wide ambient temperature range. After a decade of development, GE's Durathon Battery technology is transforming the way we look at power and energy solutions.



### Grid Connected Energy Storage Solutions for All Grid Segments

- **Renewable power generators:** Increasing value from renewable power-generating assets by avoiding curtailment, Durathon Energy Storage Systems provide predictable plant output, improving power quality and system response.
- **Traditional power generators:** Durathon Energy Storage Systems improve asset efficiency through load leveling, allowing generators to play in ancillary services markets like operating reserves, and enhance system response to allow participation in diverse markets.
- **Transmission and distribution operators:** Improving integration of renewable generation, Durathon Energy Storage Systems provide a flexible and fast solution to relieving network congestion and correcting network imbalances.
- **End users:** Durathon Energy Storage Systems reduce the cost of electricity by reducing demand charge and optimizing energy use. They also keep critical loads online during outages while maintaining high quality power.



## Telecommunications

### Increased Fuel Savings and Power Availability

- For off-grid base station sites, Durathon Batteries reduce diesel generator fuel usage and associated emissions by over 40% through their superior cycle performance and high charge acceptance.
- Durathon Batteries can operate in extreme temperatures without compromising energy delivery, cycle life and safety.
- Durathon Batteries are ideal for back-up applications in urban centers where space is at a premium, due to their high energy density.



## Uninterruptable Power Supply (UPS)

### Flexible and Uninterruptable Power

- Redundant system architecture through parallel battery modules enables increased availability; the load can be supported even if one or more modules are disconnected.
- With the ability to mix old and new modules, battery banks can be sized according to current load, allowing modules to be added as load requirements increase, providing savings in initial capital expense.
- Its compact footprint, lower weight and temperature independence mean greater flexibility for site location and reduced installation costs.
- Long service life, integrated monitoring and minimal maintenance ensure a low total cost of ownership.



## Motive

### A New Way to Power the Motive Industry

- A high-energy density solution for industrial motive and transportation industries, Durathon Batteries extend operating ranges, require fewer battery change-outs, and increase asset utilization and productivity.
- Provides world-class energy delivery and cycle life that is independent of operating environments and temperatures.
- Superior cycle life, capable of delivering 80% depth of discharge cycles daily for nearly ten years.

## A Glimpse Behind the Technology

Durathon Battery technology is based on the simple chemistry of sodium and nickel. During charging, chloride ions separate from sodium chloride and combine with nickel to form nickel chloride. The sodium ions then migrate from the cathode reservoir through a beta alumina separator to the anode reservoir. During discharge, the reverse chemical reaction occurs and sodium ions migrate from the anode reservoir through the beta alumina separator into the cathode reservoir.

Each cell is hermetically sealed within its own metal case, and is strung together with other cells in a thermally insulated battery module, which ensures that the battery's external surfaces remain within 10°C to 15°C of the surrounding ambient temperature. All Durathon Batteries are managed by the Durathon Battery Management System, which controls and protects the battery and relays information for monitoring the battery's condition.

## The Story Behind the Battery

Durathon Battery technology is transforming the way we look at alternate power and energy solutions. Originating from a pursuit of a better power source for hybrid locomotives, GE Global Research evaluated various battery technologies, leading to the identification of sodium nickel chloride batteries as the most viable solution.

In 2007, GE acquired Beta R&D, a UK-based company that originally pioneered the development of sodium metal halide batteries in the 1980s and had already demonstrated the technology's reliability and durability through years of previous research.

GE invested \$100 million into a world-class Durathon Battery manufacturing facility in Schenectady, New York. Officially opened in July 2012, production commenced in September 2011 using advanced powder processing, ceramics and welding technologies.

For more information about Durathon Battery technology, visit [www.geenergystorage.com](http://www.geenergystorage.com)

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