

The Advantages of Aqueous Hybrid Ion Batteries over Lithium Ion Batteries



INTRODUCTION

Aquion Energy's Aqueous Hybrid Ion (AHI™) batteries are the first clean and sustainable battery chemistry. Lithium ion batteries require fire suppression, HVAC, and battery management systems to maintain their safety and performance. AHI batteries don't. They are safe, easy to use, and robust. AHI applications are easier to scope, install, and operate than lithium ion batteries. AHI batteries are the ideal long-duration energy storage solution for where you live and work.

AHI ADVANTAGES OVER LITHIUM ION

	Lithium Ion	Aqueous Hybrid Ion (AHI)
Safety		
Failure	Susceptible to thermal runaway, over-charge, short circuit, and gassing conditions.	Aqueous electrolyte is non-toxic, non-caustic, and non-flammable. Battery remains safe if over-charged and has passed UL over-charge testing for toxic and combustible vapors.
Shipment and transportation	Classified as Class 9 hazardous goods for shipment and handling. Special provisions required.	Classified as standard goods. No special handling required.
Robustness		
Calendar life	Requires installation within 2-3 months from time of shipment due to irreversible side reactions while not in use.	Can be installed for up to several months from shipment, granting more application flexibility. No life-limiting side reactions while not in use.
Performance at partial states of charge (PSOC)	Most chemistries can't be cycled between 30% and 50% state of charge. Many chemistries will also experience degradation without regular maintenance cycles.	Robust to any variable cycling profiles or long duration stands at partial state of charge. Does not require maintenance cycling to maintain performance and life.
Recommended operating temperature range for optimal battery life	23°C to 28°C. Deviation from this temperature range impacts cycle life and overall performance significantly.	-5°C to 40°C. AHI batteries are characterized at 30°C and are far less susceptible to operational temperature swings.
Ease of Use		
Energy density and footprint	Usually designed to discharge between 15 minutes and 4 hours. Energy density is lower in long duration applications.	For discharge durations greater than 6 hours, AHI batteries have greater energy density and a smaller footprint.
Auxiliary loads	Requires separate power supply for auxiliary loads from HVAC and lighting, increasing costs and losses and reducing overall efficiency.	Operates without auxiliary loads. Doesn't need an external power supply.
Permitting	Safety concerns have led some municipalities to require permits for residential and commercial applications.	Inherently safe chemistry may mitigate permitting concerns.
Fire suppression	Requires costly fire suppression systems due to potential for thermal runaway and explosion.	Chemistry not capable of thermal runaway. No fire suppression system required.
Thermal management	Active thermal management required for safety, recommended for optimal battery life, and usually required to maintain warranty.	Generally none required, depending on the environment's ambient temperature.
Recycling	Must be recycled after end of life. Costs about \$2.50-\$5.00/lb, adding hidden costs to ownership.	Mechanical materials can be recycled in normal recycling streams. Chemical materials can be disposed of safely without any special equipment or containers.