



Alternatives to flow batteries





Overview

Non-lithium battery alternatives, such as vanadium flow, non-vanadium flow, and sodium-ion batteries, offer scalable, safer, and more cost-effective solutions for stationary energy storage, despite trade-offs like higher upfront costs or lower energy density.

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Advances in solid-state, sodium-ion, and flow batteries promise higher energy densities, faster charging, and longer lifespans, enabling electric vehicles to travel farther, microgrids to operate efficiently, and renewable energy to integrate seamlessly into the grid. Next-gen batteries are no.

While lithium-ion batteries dominate the energy storage market due to their high energy density and fast charging, concerns about thermal runaway and fire risk have prompted exploration of safer alternatives. Lithium iron phosphate (LFP) batteries are gaining traction for their enhanced safety.

Longer-duration storage, safety-driven procurement and FEOC compliance are starting to push alternative chemistries closer to scale. The energy storage industry walked a bumpy road in 2025, but eyes are turning toward 2026's tech stack. While lithium-ion remains dominant, pressure is building for.

As a result, researchers, suppliers, and carmakers are investigating alternative battery technologies to power the next generation of EVs. From sodium-ion to solid-state and vanadium redox flow to aluminium-air batteries, these alternatives aim to address cost, safety, and sustainability.

Two leading technologies, Lithium-ion Batteries (LiBs) and Vanadium Redox Flow Batteries (VRFBs), are at the forefront of this transition. While LiBs dominate portable devices and electric vehicles, VRFBs are emerging as a compelling alternative for large-scale, long-duration energy storage. (3 min.

ity in the market for flow batteries which is comparable to lithium-ion. But it is



expected that the market will grow as the drawbacks of technology are catered. Regardless, due to supply chain constraints and cost issues linked with lithium, a shift in focus towards alternative energy storage. What are alternatives to lithium-ion batteries?

From sodium-ion to solid-state and vanadium redox flow to aluminium-air batteries, these alternatives aim to address cost, safety, and sustainability challenges. So, let's explore five of these emerging technologies, their working principles, their advantages and disadvantages compared to lithium-ion batteries, and their adoption by carmakers.

What is a utility-grade flow battery?

Our utility-grade flow batteries are deliver performance and safety beyond li ion and are the ideal solution for developing next gen battery energy storage projects. Call our battery energy storage company today to discuss your storage needs.

Can alternative batteries power the next generation of EVs?

As a result, researchers, suppliers, and carmakers are investigating alternative battery technologies to power the next generation of EVs. From sodium-ion to solid-state and vanadium redox flow to aluminium-air batteries, these alternatives aim to address cost, safety, and sustainability challenges.

What are vanadium redox flow batteries?

Vanadium redox flow batteries (VRFBs) are rechargeable batteries that store energy in liquid electrolytes containing vanadium ions in different oxidation states, housed in external tanks. Unlike conventional batteries, VRFBs separate energy storage from power generation.



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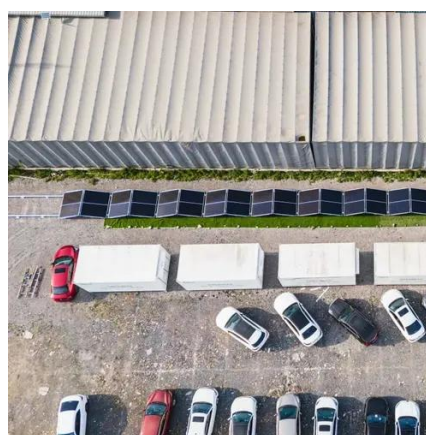


[XL Batteries CEO sees opportunity to topple ...](#)

XL Batteries CEO Tom Sisto hopes that organic flow batteries can offer a utility-scale alternative to lithium-ion, for which China has "90% ...

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Unlike lithium ion, vanadium flow batteries are non flammable, non degrading, have unlimited cycling and deliver continuous value over a 25 ...



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[Redox Flow Batteries: Lithium Alternative for Energy Storage](#)



Redox flow battery - Safer Alternatives to Lithium Ion Batteries In recent years, another type of battery known as redox flow battery has entered the segment.



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Non-lithium battery alternatives, such as vanadium flow, non-vanadium flow, and sodium-ion batteries, offer scalable, safer, and more cost-effective solutions for stationary ...

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This puts flow battery alternatives to peaking stations back on utility conference tables in North America and worldwide. How Flow ...



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The energy storage industry walked a bumpy road in 2025, but eyes are turning toward 2026's tech stack. While lithium-ion remains dominant, pressure is building for longer ...



[5 Battery Technologies That Could Replace Lithium-Ion in EVs](#)



As a result, researchers, suppliers, and carmakers are investigating alternative battery technologies to power the next generation of EVs. From sodium-ion to solid-state and ...



[Exploring Alternatives to Lithium-ion Batteries: A Guide](#)

Key alternatives include sodium-ion batteries, solid-state batteries, lithium-sulfur batteries, flow batteries, magnesium-based batteries, and graphene-enhanced batteries.



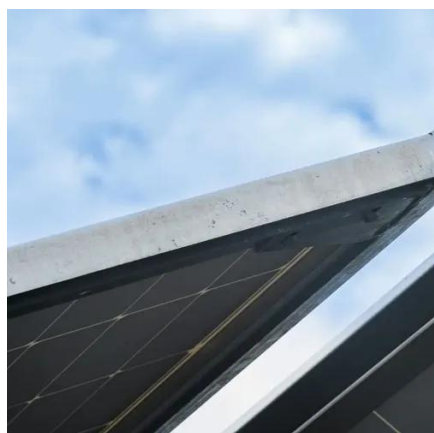
[The world is switching on to alternative battery technologies](#)

Demand for rechargeable batteries is growing as the use of solar and wind grows. While lithium-ion batteries are in the lead, other battery types are making waves. Solid state ...



[3 Alternatives: Energy Storage Options Move Beyond Lithium](#)

Single-crystal electrodes could improve lithium-ion batteries. Image used courtesy of Canadian Light Source. These limitations have spurred global efforts to explore alternatives, ...



[Beyond Lithium: How Organic Flow Batteries Could Transform ...](#)



Alongside other alternative types of battery technologies, like sodium-ion, organic flow solutions could help the data center industry overcome one of its longest-standing energy ...



[Growing Interest in Alternative Energy Storage to Benefit ...](#)

The most common types of flow batteries are vanadium redox batteries and zin bromide batteries. The battery flow technology is not widely deployed which is why there aren't many suppliers ...



[Vanadium Redox Flow Batteries: A Safer Alternative to Lithium ...](#)

Comparing Vanadium Redox Flow Batteries (VRFBs) and Lithium-Ion Batteries, focusing on safety, long-term stability, and scalability for large-scale energy storage solutions.



[What are the alternatives to vanadium for flow ...](#)

These alternatives are being developed to overcome the limitations of vanadium, including cost volatility and material availability, ...

[Vanadium Flow Batteries vs. Alternative Battery Chemistries: ...](#)



So, what will fill the gap? Flow batteries, energy storage systems where electroactive chemicals are dissolved in liquid and pumped through a membrane to store a ...



[The world is switching on to alternative battery ...](#)

Demand for rechargeable batteries is growing as the use of solar and wind grows While lithium-ion batteries are in the lead, other ...



[Non Lithium Alternatives , Energy Storage Beyond Lithium , Invinity](#)

Our utility-grade flow batteries are deliver performance and safety beyond li ion and are the ideal solution for developing next gen battery energy storage projects.



[What are the alternatives to lithium-ion batteries for grid-scale](#)

Flow Batteries (e.g., Vanadium Flow Batteries)
Flow batteries store energy in liquid electrolytes that flow through electrochemical cells, allowing for flexible scalability and long ...



[Grid-scale batteries: They're not just lithium](#)



As power utilities and industrial companies seek to use more renewable energy, the market for grid-scale batteries is expanding ...



Common and Alternative Battery Chemistries

A flow battery is a rechargeable battery in which electrolytes flow through one or more electrochemical cells from one or more tanks. For simple flow batteries, it is a straightforward ...



Vanadium Redox Flow Batteries: A Safer ...

Comparing Vanadium Redox Flow Batteries (VRFBs) and Lithium-Ion Batteries, focusing on safety, long-term stability, and ...



Energy Storage Beyond Lithium-Ion: Future Energy Storage and ...

Energy storage beyond lithium ion explores solid-state, sodium-ion, and flow batteries, shaping next-gen energy storage for EVs, grids, and future power systems.



Redox Flow Batteries: potential, alternatives and ...



The redox flow battery market, although less well known than conventional lithium or solid-state batteries, is gaining momentum as a ...





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