As part of our ongoing efforts to support utilities in exploring innovative and reliable energy storage solutions, we have compiled a set of battery manufacturer profiles that may be of interest to your organization. These profiles highlight potential domestic suppliers with relevant offerings, operational capabilities, and market presence.

Contact Sheet

Click Profile You Wish to Look at

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Alsym Energy Battery
Manufacturer	[Company Name]	Alsym Energy
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Non-lithium rechargeable battery
Chemistry	[Describe the electrochemical reaction]	Water-based, metal-free chemistry (proprietary)
Physics	[Explain the working mechanism]	Uses a novel electrochemical system with non-toxic materials to store and release energy efficiently
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid storage, maritime, residential, and industrial applications
Physical Characteristics		
Footprint	[Size of installation / space required]	
Size Range	[e.g., 5 kWh to 1 MWh]	Expected to cover small-scale to large-scale storage needs
Weight	[kg or lbs]	
Performance & Capacity		
Capacity	[kWh or MWh]	Designed for medium-to-large-scale energy storage
Rate of Charge	[e.g., 1C = full charge in 1 hour]	
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	
Round-Trip Efficiency	[% Efficiency]	Expected to be competitive with lithium-ion batteries
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-tied, off-grid capable
Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple units can be combined
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive cooling, designed to minimize thermal risks

Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	
Operational Cost	[Maintenance and efficiency loss over time]	Low, due to the absence of expensive metals and minimal safety concerns
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	
Calendar Life	[Expected lifespan in years]	
Degradation Rate	[% loss per year]	
Warranty	[Years or number of cycles covered]	
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable, non-toxic, low environmental impact
Regulatory Certifications	[UL, IEC, ISO, etc.]	
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Partnering with global energy companies and maritime industry
Project Links	[Case study URLs or application examples]	
Performance in Real-World Applications	[Any known success stories or issues]	Expected to provide safe, cost-effective, and sustainable energy storage

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Ambri Liquid Metal Battery
Manufacturer	[Company Name]	Ambri
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	2020
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Liquid Metal Battery
Chemistry	[Describe the electrochemical reaction]	Uses a calcium-based anode, a molten salt electrolyte, and an antimony-based cathode.
Physics	[Explain the working mechanism]	Relies on high-temperature electrochemical reactions to store and release energy efficiently, with self-separating components.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid storage, renewable energy integration
Physical Characteristics		
Footprint	[Size of installation / space required]	Modular, scalable installations
Size Range	[e.g., 5 kWh to 1 MWh]	Typically deployed in multi-megawatt systems
Weight	[kg or lbs]	
Performance & Capacity		
Capacity	[kWh or MWh]	Designed for long-duration energy storage, typically in the MWh range
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Optimized for multi-hour charge cycles
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Suitable for 4- to 24-hour discharge durations
Round-Trip Efficiency	[% Efficiency]	~80%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	High, capable of deep discharge cycles without significant degradation
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-tied
Scalability	[Can multiple units be combined? Yes/No]	Yes, can be combined in modular units
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive, leveraging high-temperature operation
Cost & Economic Factors		

Initial Cost ($/kWh)	[$/kWh or $ per unit]	Lower than lithium-ion for long-duration storage (exact pricing varies)
Operational Cost	[Maintenance and efficiency loss over time]	Low maintenance due to solid-state design and lack of complex cooling systems
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Competitive for long-duration applications
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	20+ years with minimal degradation
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	Very low due to self-healing chemistry
Warranty	[Years or number of cycles covered]	Typically long-term, project-specific
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable chemistry, resistant to thermal runaway
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL and industry-specific certifications
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Utility-scale projects in partnership with renewable energy developers
Project Links	[Case study URLs or application examples]	Available on Ambri's website and partner project announcements
Performance in Real-World Applications	[Any known success stories or issues]	Proven in pilot deployments, demonstrating long-duration energy storage capability

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	EnerVault Iron-Chromium Redox Flow Battery
Manufacturer	[Company Name]	EnerVault
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	2014
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Redox Flow Battery
Chemistry	[Describe the electrochemical reaction]	Iron-Chromium (Fe-Cr) redox couple
Physics	[Explain the working mechanism]	Utilizes the reversible oxidation and reduction reactions between iron and chromium ions in aqueous electrolytes to store and release energy.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid-scale energy storage, renewable energy integration, peak shaving, load leveling, backup power
Physical Characteristics		
Footprint	[Size of installation / space required]	Comparable to shipping containers; specific dimensions not publicly disclosed
Size Range	[e.g., 5 kWh to 1 MWh]	Systems designed for megawatt-hour scale applications
Weight	[kg or lbs]	
Performance & Capacity		
Capacity	[kWh or MWh]	Demonstrated system with 250 kW output for 4 hours, totaling 1 MWh
Rate of Charge	[e.g., 1C = full charge in 1 hour]	
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Designed for sustained discharge over multiple hours
Round-Trip Efficiency	[% Efficiency]	Approximately 60%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-tied
Scalability	[Can multiple units be combined? Yes/No]	Yes, systems can be scaled by increasing electrolyte volume and stack size

Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Requires active management due to exothermic and endothermic reactions during operation
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	
Operational Cost	[Maintenance and efficiency loss over time]	
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	
Calendar Life	[Expected lifespan in years]	
Degradation Rate	[% loss per year]	Minimal, as the electrolyte does not degrade significantly over time
Warranty	[Years or number of cycles covered]	
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Utilizes non-flammable, aqueous electrolytes; operates at ambient temperatures; inherently safe chemistry
Regulatory Certifications	[UL, IEC, ISO, etc.]	
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Turlock, California: 250 kW / 1 MWh system demonstrated in 2014, integrated with a 150 kW solar array and a 260 kW irrigation pump
Project Links	[Case study URLs or application examples]	https://www.greentechmedia.com/articles/read/enervault-nears-completion-of-its-first-commercial-scale-flow-battery
Performance in Real-World Applications	[Any known success stories or issues]	Demonstrated capability to store solar energy and provide power during peak demand periods. Validated the feasibility of iron-chromium redox flow batteries for utility-scale energy storage

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	EnerVenue Energy Storage Vessel
Manufacturer	[Company Name]	EnerVenue
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	
Chemistry	[Describe the electrochemical reaction]	Nickel-hydrogen
Physics	[Explain the working mechanism]	
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	
Physical Characteristics		
Footprint	[Size of installation / space required]	
Size Range	[e.g., 5 kWh to 1 MWh]	
Weight	[kg or lbs]	
Performance & Capacity		
Capacity	[kWh or MWh]	
Rate of Charge	[e.g., 1C = full charge in 1 hour]	
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	
Round-Trip Efficiency	[% Efficiency]	
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	
Scalability	[Can multiple units be combined? Yes/No]	
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	
Operational Cost	[Maintenance and efficiency loss over time]	

Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]
Lifetime & Reliability	
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]
Calendar Life	[Expected lifespan in years]
Degradation Rate	[% loss per year]
Warranty	[Years or number of cycles covered]
Assurances & Certifications	
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]
Regulatory Certifications	[UL, IEC, ISO, etc.]
Track Record & Case Studies	
Past Deployments	[Where has this battery been used?]
Project Links	[Case study URLs or application examples]
Performance in Real-World Applications	[Any known success stories or issues]

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Eos Z3
Manufacturer	[Company Name]	Eos Energy Enterprises
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	Over 80% of materials sourced domestically, with plans to reach nearly 100% U.S. sourcing in the future.
Year Introduced	[Year]	2023
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Zinc Hybrid Cathode Battery
Chemistry	[Describe the electrochemical reaction]	Utilizes a proprietary aqueous electrolyte composed of water, halides, additives, and buffering agents to enhance zinc solubility and plating.
Physics	[Explain the working mechanism]	Features non-degradable bipolar electrodes made of conductive plastic anodes and carbon-felt cathodes, simplifying internal connections to reduce resistance and improve efficiency.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Designed for 3- to 12-hour discharge duration applications, suitable for utility, industrial, and commercial energy storage needs.
Physical Characteristics		
Footprint	[Size of installation / space required]	Each Eos Cube, containing 672 Z3 battery modules, is housed in a standard 8 x 16-foot outdoor-rated shipping container
Size Range	[e.g., 5 kWh to 1 MWh]	Scalable; a single Eos Cube offers 500 kWh capacity, with installations ranging from single to multiple Cubes based on power and space requirements.
Weight	[kg or lbs]	Approximately 50,000 lbs per Eos Cube.
Performance & Capacity		
Capacity	[kWh or MWh]	Each Eos Cube provides 500 kWh of energy storage
Rate of Charge	[e.g., 1C = full charge in 1 hour]	
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Designed for 3- to 12-hour discharge durations.
Round-Trip Efficiency	[% Efficiency]	Utilizes simple forced-air ventilation, consuming approximately 2% of delivered energy, compared to 7% for traditional lithium-ion systems.

Depth of Discharge (DoD)	[% of capacity that can be used safely]	Retains over 91% of rated capacity over the product lifespan.
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Suitable for both behind-the-meter and front-of-the-meter applications, indicating flexibility in grid-tied and off-grid scenarios.
Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple Eos Cubes can be combined to meet larger energy storage requirements.
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Employs simple forced-air ventilation; does not require complex HVAC or fire suppression systems.
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	Specific cost details are not provided in the available sources.
Operational Cost	[Maintenance and efficiency loss over time]	Lower power needs for ventilation systems result in reduced annual operating expenses compared to traditional lithium-ion installations.
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Exact figures are not specified, but the use of abundant materials like zinc and simplified system design suggest a competitive LCOS.
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	Designed for a 15-year life with daily cycling capability
Calendar Life	[Expected lifespan in years]	Expected lifespan of 15 years
Degradation Rate	[% loss per year]	Retains over 91% of rated capacity over the product lifespan
Warranty	[Years or number of cycles covered]	
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable design; does not require active cooling to function
Regulatory Certifications	[UL, IEC, ISO, etc.]	
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Eos has received orders totaling 1.5 GWh for its zinc battery storage technology, indicating significant market adoption
Project Links	[Case study URLs or application examples]	
Performance in Real-World Applications	[Any known success stories or issues]	Eos's zinc-powered energy storage solutions are commercially proven and manufactured in the USA, overcoming limitations of conventional lithium-ion batteries in 3- to 12-hour intraday applications

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	ESS Iron Flow Battery
Manufacturer	[Company Name]	ESS Inc.
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	2011
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Flow Battery
Chemistry	[Describe the electrochemical reaction]	Iron-Redox Chemistry – Uses iron, salt, and water for electrochemical reactions
Physics	[Explain the working mechanism]	Operates by circulating an electrolyte solution through a cell stack, facilitating reversible oxidation and reduction of iron, storing and discharging energy.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid Storage, Long-Duration Energy Storage, Industrial Applications
Physical Characteristics		
Footprint	[Size of installation / space required]	Modular and scalable; typically containerized solutions
Size Range	[e.g., 5 kWh to 1 MWh]	50 kW / 400 kWh per module, scalable up to multi-megawatt systems
Weight	[kg or lbs]	Varies by system size; approximately 12,000 lbs for a 400 kWh module
Performance & Capacity		
Capacity	[kWh or MWh]	400 kWh per unit, scalable
Rate of Charge	[e.g., 1C = full charge in 1 hour]	~6-8 hours for full charge
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Can discharge for 4-12 hours depending on configuration
Round-Trip Efficiency	[% Efficiency]	~70-75%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	100%
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	AC Coupled, Grid-Tied
Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple units can be combined
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive cooling with minimal HVAC needs

Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	Competitive with other long-duration storage options
Operational Cost	[Maintenance and efficiency loss over time]	Low maintenance due to non-degrading electrolyte
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Lower than lithium-ion for long-duration applications
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	Unlimited cycling capability due to non-degrading electrolyte
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	Negligible
Warranty	[Years or number of cycles covered]	Typically 20 years
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable, non-toxic electrolyte, no risk of thermal runaway
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL 9540, UL 1973, IEC compliance
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Deployed in multiple utility-scale projects in the U.S. and worldwide
Project Links	[Case study URLs or application examples]	https://www.essinc.com/case-studies/
Performance in Real-World Applications	[Any known success stories or issues]	Proven long-duration energy storage for renewable integration, peak shifting, and microgrids.

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Form Energy Battery
Manufacturer	[Company Name]	Form Energy
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	Yes
Year Introduced	[Year]	2021
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Iron-Air Battery
Chemistry	[Describe the electrochemical reaction]	Iron oxidation and reduction chemistry
Physics	[Explain the working mechanism]	Stores and releases energy by rusting and unrusting iron
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Long-duration energy storage for grid-scale applications
Physical Characteristics		
Footprint	[Size of installation / space required]	Large-scale industrial installations
Size Range	[e.g., 5 kWh to 1 MWh]	Megawatt-hour (MWh) scale
Weight	[kg or lbs]	Heavy due to iron-based chemistry
Performance & Capacity		
Capacity	[kWh or MWh]	100+ hours of storage
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Optimized for slow charge cycles
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Optimized for slow discharge over multiple days
Round-Trip Efficiency	[% Efficiency]	~80-90%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	Designed for deep discharge (~100% DoD)
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-tied, renewable energy integration
Scalability	[Can multiple units be combined? Yes/No]	Highly scalable for grid expansion
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Air-cooled passive system
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	Estimated at <$20/kWh

Operational Cost	[Maintenance and efficiency loss over time]	Minimal operational cost due to iron-based chemistry
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Ultra-low LCOS due to longevity
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	10,000+ cycles
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	<1% per year
Warranty	[Years or number of cycles covered]	10-year manufacturer warranty
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable, no thermal runaway, environmentally friendly materials
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL, DOE-backed research approvals in progress
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Pilot projects with multiple utilities
Project Links	[Case study URLs or application examples]	Form Energy Projects
Performance in Real-World Applications	[Any known success stories or issues]	https://formenergy.com/great-river-energy-and-form-energy-break-ground-on-first-of-its-kind-multi-day-energy-storage-project/

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Natron Energy Battery
Manufacturer	[Company Name]	Natron Energy
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	TRUE
Year Introduced	[Year]	2024
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Sodium-Ion
Chemistry	[Describe the electrochemical reaction]	Utilizes Prussian blue analogues for both cathode and anode with an aqueous electrolyte
Physics	[Explain the working mechanism]	Sodium ions intercalate into Prussian blue crystal structures during charge and discharge cycles
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Designed for critical power applications, including data centers and industrial settings
Physical Characteristics		
Footprint	[Size of installation / space required]	Standard rack-mounted design compatible with existing infrastructure
Size Range	[e.g., 5 kWh to 1 MWh]	Specific capacity details not provided; designed for scalability
Weight	[kg or lbs]	Not specified
Performance & Capacity		
Capacity	[kWh or MWh]	Specific capacity details not provided; designed for critical power applications
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Full recharge in 15 minutes or less
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Optimal discharge time of 2-5 minutes
Round-Trip Efficiency	[% Efficiency]	Greater than 97%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Compatible with systems ranging from 48V to 480V
Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple units can be combined for increased capacity
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Not specified; however, the battery is rated nonflammable at the cell level with no thermal runaway under any condition

Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	
Operational Cost	[Maintenance and efficiency loss over time]	
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	More than 50,000 deep discharge cycles
Calendar Life	[Expected lifespan in years]	
Degradation Rate	[% loss per year]	
Warranty	[Years or number of cycles covered]	
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Rated nonflammable at the cell level with no thermal runaway under any condition
Regulatory Certifications	[UL, IEC, ISO, etc.]	Achieved UL 1973 safety standard for energy storage systems
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Commercial production began in Holland, Michigan, in April 2024
Project Links	[Case study URLs or application examples]	
Performance in Real-World Applications	[Any known success stories or issues]	

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	PolyJoule Battery
Manufacturer	[Company Name]	PolyJoule
BABA	[Build America, Buy America Act (2021)	TRUE
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
Year Introduced	[Year]	2019
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Carbon-Based Battery
Chemistry	[Describe the electrochemical reaction]	Conductive polymer-based electrolyte
Physics	[Explain the working mechanism]	Electrochemical storage via carbon-polymer interactions
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid storage, backup power, industrial applications
Physical Characteristics		
Footprint	[Size of installation / space required]	Compact, scalable modules
Size Range	[e.g., 5 kWh to 1 MWh]	Flexible size configurations
Weight	[kg or lbs]	Lightweight compared to metal-based batteries
Performance & Capacity		
Capacity	[kWh or MWh]	10 kWh - 1 MWh
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Fast charging capability (~15 min for some applications)
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	High discharge rates (~10C)
Round-Trip Efficiency	[% Efficiency]	98%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	95% DoD supported
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	DC & AC Coupling
Scalability	[Can multiple units be combined? Yes/No]	Highly scalable
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive cooling, no liquid components
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	$100-$150/kWh (estimated)

Operational Cost	[Maintenance and efficiency loss over time]	Low maintenance, minimal operational costs
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Competitive LCOS due to long cycle life
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	20,000+ cycles @ 80% capacity
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	<1% per year
Warranty	[Years or number of cycles covered]	10-year standard warranty
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable, no thermal runaway, no hazardous materials
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL, IEC certifications in progress
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Tested in microgrid environments and industrial backup applications
Project Links	[Case study URLs or application examples]	https://www.polyjoule.com/about
Performance in Real-World Applications	[Any known success stories or issues]	High efficiency in real-world tests; scalable and low maintenance

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Quino Flow Battery
Manufacturer	[Company Name]	Quino Energy
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Flow Battery
Chemistry	[Describe the electrochemical reaction]	Organic Aqueous Flow Battery – utilizes quinone-based electrolytes in an aqueous solution for energy storage.
Physics	[Explain the working mechanism]	The battery functions by storing energy in liquid electrolytes containing quinones, which undergo reversible redox reactions to charge and discharge energy. The separation of power and energy components allows for independent scaling and long-duration storage.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid Storage, Commercial & Industrial Energy Storage, Microgrids, Renewable Integration
Physical Characteristics		
Footprint	[Size of installation / space required]	Modular design; varies based on system configuration
Size Range	[e.g., 5 kWh to 1 MWh]	Scalable, from kWh to MWh-scale
Weight	[kg or lbs]	Depends on electrolyte storage volume
Performance & Capacity		
Capacity	[kWh or MWh]	Modular; dependent on tank size
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Typically slower than lithium-ion (customizable)
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Configurable based on electrolyte flow rate
Round-Trip Efficiency	[% Efficiency]	~70-80%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	100% (as flow batteries can fully deplete electrolytes without damage)
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-Tied, AC Coupled
Scalability	[Can multiple units be combined? Yes/No]	Yes, highly modular

Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive or minimal active cooling required
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	Expected to be lower than lithium-ion but depends on deployment scale
Operational Cost	[Maintenance and efficiency loss over time]	Lower maintenance than lithium-ion; electrolyte replacement required over time
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Projected to be competitive for long-duration storage
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	10,000+ cycles
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	Minimal compared to lithium-ion
Warranty	[Years or number of cycles covered]	Typically long due to stable chemistry
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable aqueous electrolyte, no thermal runaway risk
Regulatory Certifications	[UL, IEC, ISO, etc.]	
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Early-stage commercialization, pilot projects underway
Project Links	[Case study URLs or application examples]	
Performance in Real-World Applications	[Any known success stories or issues]	

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	Ohm Core Home Battery
Manufacturer	[Company Name]	Urban Electric Power
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	TRUE
Year Introduced	[Year]	2022
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Rechargeable Alkaline Zinc Manganese Dioxide
Chemistry	[Describe the electrochemical reaction]	Utilizes zinc anode and manganese dioxide cathode in an alkaline electrolyte, enabling rechargeable capabilities
Physics	[Explain the working mechanism]	During discharge, zinc oxidizes at the anode, and manganese dioxide reduces at the cathode; the process is reversed during charging
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Residential energy storage, backup power, integration with renewable energy sources
Physical Characteristics		
Footprint	[Size of installation / space required]	Compact, floor or wall-mounted design suitable for indoor installations
Size Range	[e.g., 5 kWh to 1 MWh]	8.8 kWh per unit
Weight	[kg or lbs]	395 lbs (179 kg)
Performance & Capacity		
Capacity	[kWh or MWh]	8.8 kWh
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Specific charge rate not specified; designed for standard residential charging scenarios
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	1.5 kW continuous, 2 kW peak
Round-Trip Efficiency	[% Efficiency]	Approximately 87%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	AC-coupled; compatible with 120/240V systems
Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple units can be combined for increased capacity
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive; operates within -20°C to 60°C without active cooling
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	

Operational Cost	[Maintenance and efficiency loss over time]	Minimal maintenance required; designed for long-term reliability
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	Specific cycle life not detailed; designed for long-term use
Calendar Life	[Expected lifespan in years]	Expected lifespan upwards of 10 years
Degradation Rate	[% loss per year]	
Warranty	[Years or number of cycles covered]	
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable materials; safe for indoor installation without additional safety systems
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL1973 / UL9540A
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Technology tested and proven in data centers and grid infrastructure projects, including installations for Con Edison in New York and the Tennessee Valley Authority
Project Links	[Case study URLs or application examples]	urbanelectricpower.com
Performance in Real-World Applications	[Any known success stories or issues]	Demonstrated reliability and safety in various commercial and residential settings

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Battery Profile

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	ViZn Flow Battery
Manufacturer	[Company Name]	ViZn Energy Systems
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	TRUE
Year Introduced	[Year]	
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	Flow Battery
Chemistry	[Describe the electrochemical reaction]	Zinc-Iron Redox Flow Battery – utilizes a non-toxic, non-flammable electrolyte solution where zinc and iron electrochemical reactions store and release energy.
Physics	[Explain the working mechanism]	The battery works by pumping liquid electrolytes through electrochemical cells, where zinc is plated and dissolved during charging and discharging, respectively. The separation of power and energy components allows for independent scaling and long-duration storage.
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	Grid Storage, Commercial & Industrial Energy Storage, Microgrids, Renewable Integration
Physical Characteristics		
Footprint	[Size of installation / space required]	Modular design; varies based on system configuration
Size Range	[e.g., 5 kWh to 1 MWh]	Scalable from 100 kWh to multiple MWh
Weight	[kg or lbs]	Dependent on system size and installation
Performance & Capacity		
Capacity	[kWh or MWh]	Configurable, typically in the range of hundreds of kWh to multi-MWh
Rate of Charge	[e.g., 1C = full charge in 1 hour]	Typically around 4-6 hours for full charge
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	Configurable, designed for long-duration discharge (4-10+ hours)
Round-Trip Efficiency	[% Efficiency]	~70-75%
Depth of Discharge (DoD)	[% of capacity that can be used safely]	100%
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	Grid-Tied, DC Coupled, AC Coupled

Scalability	[Can multiple units be combined? Yes/No]	Yes, multiple units can be combined for large-scale deployments
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	Passive and liquid-cooled options available
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	Estimated lower than lithium-ion for long-duration applications
Operational Cost	[Maintenance and efficiency loss over time]	Low; minimal degradation, low maintenance due to non-corrosive chemistry
Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]	Competitive for long-duration storage, with a focus on reduced total cost of ownership over time
Lifetime & Reliability		
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]	20,000+ cycles
Calendar Life	[Expected lifespan in years]	20+ years
Degradation Rate	[% loss per year]	Minimal (near-zero capacity fade over lifetime)
Warranty	[Years or number of cycles covered]	10-20 years depending on the application
Assurances & Certifications		
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]	Non-flammable, non-toxic electrolyte; no risk of thermal runaway
Regulatory Certifications	[UL, IEC, ISO, etc.]	UL, IEC compliance (specific certifications to be confirmed)
Track Record & Case Studies		
Past Deployments	[Where has this battery been used?]	Various commercial and industrial projects in North America and Europe
Project Links	[Case study URLs or application examples]	
Performance in Real-World Applications	[Any known success stories or issues]	

Utility-scale battery storage systems are increasingly deployed to enhance grid reliability, integrate renewable energy, and provide ancillary services. The most common types are:

1. Lithium-Ion Batteries

Overview: By far the most widely used for utility-scale applications.

Advantages:

High energy density.

Fast response times.

Long cycle life (thousands of charge/discharge cycles).

Scalability and flexibility for various applications, including energy shifting and frequency regulation.

Limitations:

Cost (though prices are declining).

Safety concerns (thermal runaway risk).

Environmental concerns regarding mining and recycling.

Applications: Renewable energy integration, frequency regulation, and peak shaving.

2. Flow Batteries

Types:

Vanadium Redox Flow Batteries (VRFB).

Zinc-Bromine Flow Batteries.

Advantages:

Long-duration storage (4–12 hours or more).

Decoupled energy and power capacity (can store large amounts of energy without increasing power output).

Excellent cycle life and durability.

Limitations:

Lower energy density than lithium-ion.

Higher upfront cost.

Complexity of system (requires pumps and tanks for electrolyte circulation).

Applications: Long-duration storage, grid resiliency, and renewable energy firming.

3. Sodium-Based Batteries

Types:

Sodium-Sulfur (NaS).

Sodium-Nickel Chloride (ZEBRA).

Advantages:

High energy capacity and long duration (up to 6–8 hours).

Tolerance to extreme temperatures.

Materials are more abundant and less environmentally impactful than lithium.

Limitations:

High operating temperatures (300–350°C).

Slower response compared to lithium-ion.

Applications: Grid-scale applications requiring steady discharge over long durations.

4. Lead-Acid Batteries

Overview: A mature technology, traditionally used in smaller applications but occasionally deployed at utility scale.

Advantages:

- Low upfront cost.
- Simple manufacturing process.
- Recyclable (over 90% of lead in batteries is recyclable).

Limitations:

- Shorter cycle life.
- Lower energy density.
- Regular maintenance requirements.

Applications: Backup power and limited-duration grid applications.

5. Nickel-Based Batteries

Types:

- Nickel-Cadmium (NiCd).
- Nickel-Metal Hydride (NiMH).

Advantages:

- Tolerance to extreme conditions.
- Long lifecycle.

Limitations:

- High cost.
- Cadmium toxicity (environmental concerns for NiCd).

Applications: Specialty applications in remote or harsh environments.

6. Solid-State Batteries

Overview: Emerging technology, still in early deployment stages for utility-scale.

Advantages:

- Higher energy density and safety compared to lithium-ion (no liquid electrolytes).
- Potential for lower costs in the long term.

Limitations:

- Still in development, not widely commercially available.
- Scalability challenges.

Applications: Next-generation energy storage systems.

7. Hydrogen Storage (Fuel Cells)

Overview: Electrolyzers produce hydrogen stored for conversion back to electricity using fuel cells.

Advantages:

- Very long-duration storage potential (days to months).
- Scalable for large projects.

Limitations:

- Low round-trip efficiency (30–50%).
- High cost of electrolyzers and storage infrastructure.

Applications: Seasonal energy storage, balancing renewable energy over long periods.

8. Flywheels

Overview: Store energy as rotational kinetic energy.

Advantages:

- Extremely fast response times.

- High durability and lifespan (millions of cycles).
- No degradation over time.

Limitations:

- Limited energy storage capacity.
- High upfront costs.

Applications: Frequency regulation, short-term power stabilization.

Battery Glossary

General Information

Battery Name: The specific name or model of the battery technology.

Manufacturer: The company or entity responsible for producing the battery.

BABA (Build America, Buy America Act): A U.S. federal requirement that infrastructure projects use American-made materials, including domestically manufactured batteries.

Year Introduced: The year the battery technology was first commercialized or made available for use.

Battery Type: The classification of the battery based on its electrochemical composition (e.g., lithium-ion, sodium-ion, flow battery).

Chemistry: The specific materials and chemical reactions that store and release energy within the battery.

Physics: The underlying principles governing the battery's function, such as ion movement, phase changes, or redox reactions.

Use Cases: The primary applications for the battery, such as grid storage, electric vehicles, residential power backup, or industrial energy storage.

Physical Characteristics

Footprint: The physical space the battery system occupies when installed.

Size Range: The range of available sizes or configurations for the battery system.

Weight: The total mass of the battery, which affects transportability and installation considerations.

Performance & Capacity

Capacity: The amount of energy a battery can store, typically measured in kilowatt-hours (kWh) or megawatt-hours (MWh).

Rate of Charge: The speed at which a battery can be charged, often expressed as a C-rate (e.g., 1C = full charge in 1 hour).

Rate of Discharge: The speed at which a battery releases stored energy, also expressed in C-rate or kW output.

Round-Trip Efficiency: The percentage of energy retained after a complete charge and discharge cycle, considering energy losses due to heat and resistance.

Depth of Discharge (DoD): The percentage of total capacity that can be used without causing significant degradation of the battery.

Integration & Scalability

Integration Type: How the battery connects to the electrical system (e.g., DC-coupled, AC-coupled, grid-tied, off-grid).

Scalability: The ability to expand the battery system by adding more units or modules to increase storage capacity.

Thermal Management: The cooling or heating systems used to maintain battery performance and longevity (e.g., air-cooled, liquid-cooled, passive cooling).

Cost & Economic Factors

Initial Cost ($/kWh): The upfront cost of purchasing and installing the battery, measured per unit of stored energy.

Operational Cost: The ongoing expenses related to maintenance, energy loss, and system management.

Levelized Cost of Storage (LCOS): The total cost per kWh over the battery's lifetime, including initial investment, maintenance, and efficiency losses.

Lifetime & Reliability

Cycle Life: The number of charge-discharge cycles a battery can undergo before its capacity significantly degrades.

Calendar Life: The total lifespan of the battery in years, regardless of cycle count.

Degradation Rate: The rate at which a battery loses capacity over time, typically expressed as a percentage per year.

Warranty: The manufacturer’s guarantee on performance, cycle life, and longevity, typically covering a set number of years or cycles.

Assurances & Certifications

Safety Features: Built-in protections against overheating, overcharging, and short circuits to ensure safe operation.

Regulatory Certifications: Compliance with industry and government safety standards (e.g., UL, IEC, ISO certifications).

Track Record & Case Studies

Past Deployments: Examples of real-world installations where the battery has been used.

Project Links: Online resources providing details about completed battery projects and their performance.

Performance in Real-World Applications: Data and case studies showing how the battery performs in practical scenarios, including efficiency, reliability, and maintenance requirements.

Battery Profile Template

Attribute	Details Description	Details
General Information		
Battery Name	[Enter Battery Name]	
Manufacturer	[Company Name]	
Reviewed by Manufacturer for accuracy	[Has the manufacturer reviewed this document]	FALSE
BABA	[Build America, Buy America Act (2021)	
Year Introduced	[Year]	
Battery Type	[e.g., Sodium-Ion, Iron-Air, Flow Battery]	
Chemistry	[Describe the electrochemical reaction]	
Physics	[Explain the working mechanism]	
Use Cases	[e.g., Grid Storage, EVs, Residential, Industrial]	
Physical Characteristics		
Footprint	[Size of installation / space required]	
Size Range	[e.g., 5 kWh to 1 MWh]	
Weight	[kg or lbs]	
Performance & Capacity		
Capacity	[kWh or MWh]	
Rate of Charge	[e.g., 1C = full charge in 1 hour]	
Rate of Discharge	[e.g., 0.5C = 2-hour discharge]	
Round-Trip Efficiency	[% Efficiency]	
Depth of Discharge (DoD)	[% of capacity that can be used safely]	
Integration & Scalability		
Integration Type	[DC Coupled, AC Coupled, Grid-Tied, Off-Grid]	
Scalability	[Can multiple units be combined? Yes/No]	
Thermal Management	[Air-cooled, Liquid-cooled, Passive]	
Cost & Economic Factors		
Initial Cost ($/kWh)	[$/kWh or $ per unit]	
Operational Cost	[Maintenance and efficiency loss over time]	

Levelized Cost of Storage (LCOS)	[$ per kWh over lifetime]
Lifetime & Reliability	
Cycle Life	[e.g., 5,000 cycles @ 80% capacity]
Calendar Life	[Expected lifespan in years]
Degradation Rate	[% loss per year]
Warranty	[Years or number of cycles covered]
Assurances & Certifications	
Safety Features	[Thermal runaway prevention, short-circuit protection, etc.]
Regulatory Certifications	[UL, IEC, ISO, etc.]
Track Record & Case Studies	
Past Deployments	[Where has this battery been used?]
Project Links	[Case study URLs or application examples]
Performance in Real-World Applications	[Any known success stories or issues]