



12V storage technology trends China & Asia & ROW

Technical Comparison: LAB vs. LFP vs. SIB



Parameter	Lead-Acid (LAB)	Lithium (LFP)	Sodium-Ion (SIB)
Lifespan	3-5 years	Vehicle lifespan	8-10 years expected
Weight Reduction	Baseline	60%+ reduction	30-40% reduction
Low-Temp (-20°C)	Fair	Low	Excellent ≥85% retention
Cost (2025)	Lowest	Mid-High	Mid, declining
Energy Density	35-45 Wh/kg	160-180 Wh/kg	100-140 Wh/kg
Safety Profile	Stable, mature	Excellent thermal stability	High intrinsic safety
BMS Complexity	None required	Standard required	Simplified vs. LFP

Key insight: Each chemistry serves distinct application scenarios. Cost-per-mile and lifecycle considerations drive market segmentation.

Application Scenarios & BMS Architecture Requirements



ICE Vehicles

Flooded Lead-Acid (Standard)

- Cold-start power source
- Baseline cost reference

AGM/EFB (Evolving)

- Start-stop systems
- Extended cycle life
- 15-20% cost premium

Lithium (Premium)

- High-end vehicles
- 48V mild-hybrid systems
- 2.0-3.0x cost multiplier

NEV (BEV + PHEV)

Entry-Level (Sodium-ion emerging)

- Low-voltage distribution
- Safety redundancy
- 30-40% lighter than LAB

Mid-Range (LFP standard)

- Integrated thermal mgmt
- Zonal architecture (48V+)
- Full lifecycle maintenance-free

Premium (LFP + 48V)

- Steer-by-wire redundancy
- Split low-voltage domains

BMS trend: From simple protection → integrated energy management system

Market Evolution Roadmap: 2026-2030+



2026-2027 | Short-Term

- LAB dominates fuel vehicles
- LFP rapidly penetrates BEVs
- SIB mass production begins
- Cost gap narrowing: 20-30%
- Northern China cold-start focus

2028-2029 | Mid-Term

- SIB scale-up accelerating
- LFP + SIB parallel adoption
- LAB marginal in low-cost EV
- Market share: LAB 10-15%
- 48V systems expanding (assumed)

2030+ | Long-Term

- Li-ion + Na-ion 2/3 incremental
- LAB niche markets only
- Maintenance-free standard
- Zonal architecture mainstream
- Thermal integration critical

Technology competition intensifies; cost convergence accelerates application breadth

Critical Drivers & Market Challenges

Drivers

Vehicle Intelligence

- Steer-by-wire, brake-by-wire
- Higher pulse discharge & redundancy

Vehicle Architecture Evolution

- 48V systems (expected)
- Zonal architecture (assumed)
- Refined energy management

Cost Convergence

- Li-ion: -60% over 15 years
- Na-ion: Approaching LFP cost
- Entry-level penetration accelerating

Challenges

BMS Complexity & Cost

- Lithium + sodium require advanced BMS
- Total cost initially 2-3x higher
- Slows low-end penetration

Standard Unification

- SIB: National/intl standards in progress
- Gap constrains commercialization

Thermal Management

- 48V + zonal arch = integration challenge
- Design validation still ongoing
- Supply chain immature

Key Takeaways

➤ **LFP = New Standard**

NEV 12V systems: LFP is the definite direction. Cost reduction accelerating from premium to mainstream.

➤ **SIB as Dark Horse**

2026's biggest variable. Exceptional cold performance ($\geq 85\%$ retention @ -40°C) reshapes northern(cold) / entry-level markets.

➤ **System Integration Critical**

Low-voltage battery evolution = deep integration with thermal, zonal architecture, and vehicle intelligence.

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