SECTOR UPDATE

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Rechargeable Batteries (OVERWEIGHT)

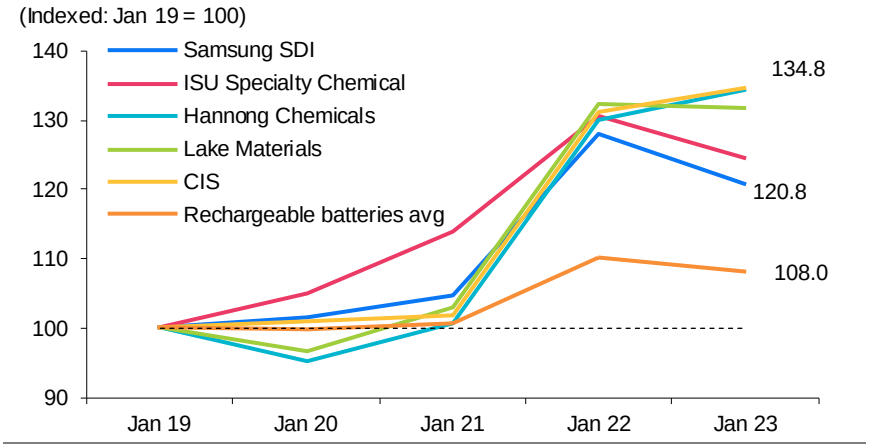
Dialogue with market #48: Korea bets on solid-state; China commercializing semi-solid

- Shares across the solid-state battery value chain posted strong gains last week, supported by humanoid robot hype.
- China is accelerating the commercialization of semi-solid-state batteries and laying the groundwork for national standards for all-solid-state batteries.
- BloombergNEF estimates that all-solid-state and semi-solid-state batteries will account for a respective 0.6% and 5% of total demand by 2030.

WHAT'S THE STORY?

Introduction: In the 48th edition of *Dialogue with the market*, we assess the recent resurgence of enthusiasm for solid-state batteries in Korea's rechargeable battery sector. Market interest in humanoid robots has intensified following CES 2026, and this momentum has spilled over into solid-state battery stocks. At the same time, China began commercializing semi-solid-state batteries late last year and, at the national level, initiated efforts to establish technical standards for all-solid-state batteries. That said, investors should question the durability of the current rally, given a similar run-up in 1Q25 ahead of the InterBattery—only to be followed by a correction amid weak fundamentals.

Solid-state battery value chain: Share-price performances



Source: Bloomberg, Samsung Securities

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Issue 1. Solid-state battery value chain names performing strongly in Korea: Korean rechargeable battery stocks moved largely sideways early this year, but solid-state battery-related names rallied sharply last week. While the broader rechargeable battery value chain delivered average weekly gains of 8%, solid-state battery plays significantly outperformed, with some going limit up. Samsung SDI leapt 21% for the week, while CIS surged 35%. The rally appears to reflect growing optimism around humanoid robots, reignited after Hyundai Motor Group's Boston Dynamics unveiled its Atlas robot at CES 2026. Investors are increasingly willing to pay a premium for companies tied to the solid-state battery value chain, which is viewed as a critical component of next-generation robotics. With CES now nearly two weeks behind us, however, it is worth considering whether the rally is underpinned by compelling fundamentals.

Humanoid robot market expansion a valid catalyst for all-solid-state batteries: The potential expansion of the humanoid robot market highlighted at this year's CES could plausibly support long-term growth for all-solid-state batteries. Humanoid robots are primarily designed for high-intensity labor environments and must therefore rely entirely on onboard power, requiring batteries with high energy density, in both weight and volume terms. In addition, unlike EVs—whose battery volume and cost account for a significant portion of total system costs—humanoid robots face tighter spatial constraints and have lower cost sensitivities. All told, once all-solid-state batteries achieve commercial viability, adoption in the humanoid robot segment is likely to be strong.

Unveiling of HMG's Atlas fuels optimism for Korea's solid-state battery value chain: Following the unveiling of HMG's humanoid robot Atlas, HMC's share price has surged approximately 70% ytd. Amid the enthusiastic market response, investors are increasingly viewing battery supply for HMG's robots as a new investment opportunity. While detailed battery specifications for Atlas have not been disclosed, the robot is described as using two swappable (hot-swap) battery packs, providing approximately four hours of operation for general tasks and two hours for high-intensity work. Assuming power consumption equivalent to two 1.2 kW batteries depending on task intensity, we estimate total battery capacity at roughly 2-3 kWh. At present, high-nickel ternary batteries with high energy density are the most likely solution , given the operating requirements of humanoid robots. However, the longer-term potential for adoption of solid-state batteries is considered high.

Atlas: Modular battery pack

Source: Boston Dynamics

Atlas: Key specifications

Category	Item	Specifications
Physical specs	Height	1.9 m
	Weight	90 kg
	Sensory capabilities	Tactile sensors, 360° camera vision
Power	Battery life	4 hours
	Payload capacity	50 kg (rated: 30 kg)

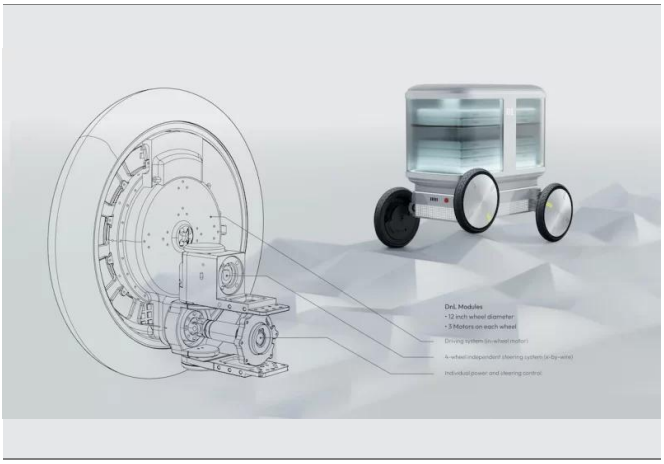
Source: Boston Dynamics

Samsung SDI-HMG robot battery collaboration focused on MobED platform: Samsung SDI is frequently cited as a potential battery supplier for Atlas, particularly within the solid-state battery value chain. This stems from the MOU signed with HMG in Feb 2025 to jointly develop high-performance robot-specific batteries with enhanced energy density, output, and operating time. IN addition, at last year's InterBattery event, SDI's booth featured HMG's service robot DAL-e and the Mobile Eccentric Droid (MobED) platform. MobED, HMG's next-generation autonomous mobility robot, won a Best of Innovation award in the Robotics category at CES 2026, drawing significant media attention alongside the Atlas robot. However, as a mobility platform based on eccentric-wheel technology, MobED is unlikely to be directly applied to humanoid robots such as Atlas. Therefore, whether the HMG-SDI collaboration on robot-specific batteries evolves from mobility platforms to physical AI applications remains an open question.

MobED platform robot

Source: Hyundai Motor Group

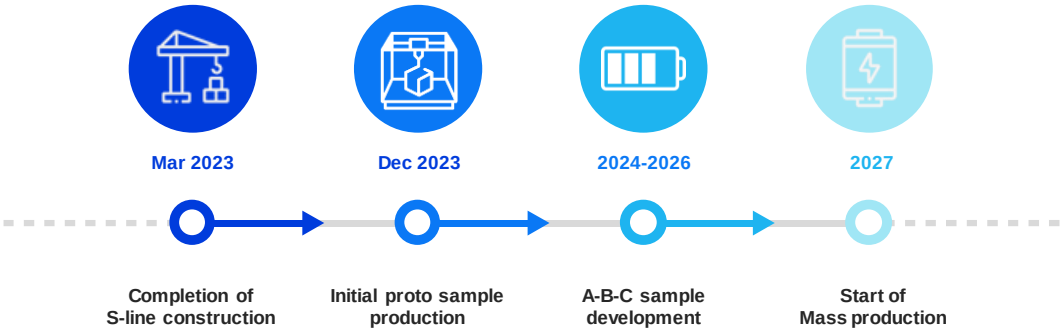
MobED platform drivetrain design



Source: Media

Samsung SDI targeting solid-state battery mass-production from 2027: Among Korean solid-state battery developers, SDI has been the most explicit in setting a commercialization timeline, targeting mass-production in 2027 using sulfide-based technology. The company completed construction of its S-line facility in 2023, released A-samples in late 2024, and completed B-sample development in 1H25. However, there has been no confirmation of progress toward the C-sample stage, which is typically considered a key milestone before commercialization. Reports last year indicated a shift in manufacturing processes from warm isostatic pressing (WIP) to roll-press technology. Whether the firm can still meet its 2027 target is likely to be a key focus at the upcoming InterBattery event in mid-March.

Samsung SDI: Solid-state battery commercialization roadmap



Source: Samsung Securities estimates

Korea: Solid-state battery value chain

Category	Company	Solid-state battery technology	Mass production	Capacity
Cell	Samsung SDI	Sulfide-based solid electrolyte; pilot line	2027	
	LG Energy Solution	Polymer-based solid electrolyte (under development)	2026 (polymer), 2030 (sulfide)	
Material	Isu Specialty Chemical	Lithium sulfide (Li_2S) production	Mass-production	40 tonnes/year
	Han Nong Chemical	Polymer electrolyte materials (under development)	TBD	
	Lake Materials	Lithium sulfide production process technology via Lake Technology	TBD	
	Lotte Energy Materials	Sulfide-based solid electrolyte; pilot line	TBD	
	Posco JK Lead Solution	Oxide/sulfide solid electrolytes (under development)	TBD	24 tonnes/year
	Jeongseok Chemical	Lithium sulfide (Li_2S) production	Mass-production	24 tonnes/year
	InChems	Sulfur-based solid electrolyte (atmosphere-stable)	Mass-production	120 tonnes/year
	Deoksan Futurecell	Oxide-based materials; semiconductor-based patents	TBD	
Equipment	CIS	Dry coater for solid-state batteries (under development)	TBD	
	Ilshin Autoclave	WIP (ultra-high pressure hot isostatic press) equipment production	Mass-production	
	mPlus	Press equipment for solid-state batteries (under development)	TBD	

Source: Media, Samsung Securities

Issue 2. China pursues semi-solid-state battery commercialization and draft national standards on all-solid-state batteries: On Dec 30, China's National Technical Committee of Auto Standardization released a draft national standard for "all-solid-state batteries for EVs." The draft outlines terminology, classification, and coding systems, and categorizes batteries—based on ion-transfer mechanism within the cell—into three types: liquid batteries, solid-liquid hybrid batteries, and all-solid-state batteries. Notably, the Committee clarified that the term "semi-solid-state battery" widely used in the industry to date, will not be formally adopted in the standard. Public consultation on the draft runs through Feb 28.

China: National standards for solid-state batteries

Category	Content
Term classification	Categorizes batteries into three types (based on ion-transfer mechanism): liquid batteries, hybrid solid-liquid batteries, and solid-state batteries
Solid-state battery criteria	Mass loss rate ≤ 0.5% (tested under dry/vacuum conditions)
Technology classification	• Classification by electrolyte type: sulfide, oxide, polymer, halide, composite • Classification by transmitted ion: lithium ion, sodium ion, *etc* • Classification by application: high-energy and high-power types
Roadmap	• Part 1: Terms and classifications (current draft) • Part 2: Performance requirements • Part 3: Safety standards (fire, shock, *etc*) • Part 4: Lifetime and durability standards

Source: China National Technical Committee of Auto Standardization, media, Samsung Securities

Semi-solid-state batteries partially replace liquid electrolytes with solid materials such as gels or polymers, delivering higher energy density than conventional liquid-electrolyte batteries. These are widely viewed as a transitional technology toward all-solid-state batteries and benefit from compatibility with existing production lines. Chinese companies are at the forefront of development.

- EV manufacturer NIO has reportedly achieved a 1,000 km driving range using semi-solid-state batteries supplied by WeLion.
- SAIC has launched the MG4 EV equipped with semi-solid-state batteries from Qingtao.
- Ganfeng has built 2 GWh of production capacity for semi-solid-state batteries and is targeting applications in eVTOLs and ESS. The company views eVTOLs as particularly well-suited to semi-solid-state batteries, given that it is less price-sensitive and more performance-driven, and requires high discharge rates.

In summary, China is broadening the commercialization of semi-solid-state batteries across EVs, HEVs, eVTOLs, and ESS, while simultaneously laying the groundwork for all-solid-state battery development. By establishing national technical standards, China is positioning to secure an early lead in the eventual commercialization of all-solid-state batteries. According to a 2024 report by LG Business Research, semi-solid-state batteries offer lower stability and energy performance that all-solid-state batteries, but are more cost-effective thanks to their compatibility with existing production lines and more-limited material changes. While their cost is roughly twice that of conventional lithium-ion batteries, they deliver more than double the energy density, reducing price resistance and making them viable for commercialization.

Chinese semi-solid and solid-state battery development: Status and characteristics

Category	Company	Features	Mass-production	Target market	Energy density
Semi-solid	CATL	Gel polymer/ solid-liquid mixture	In production	eVTOL	350 Wh/kg or more
	Gangfeng	LFP-based semi-solid	In production	eVTOL, ESS	300 Wh/kg or more
	WeLion	Solid-liquid mixture	In production	EV, ESS	360 Wh/kg
	Beijing Xingchuan	Gel polymer	2026	HEV	N/A
	Qingtao	Solid-liquid mixture	In production	EV, ESS	300-368 Wh/kg
Solid-state	CATL	Sulfide-based	2027	Next-generation EV	500 Wh/kg or more
	BYD	Sulfide-based	2027	EV	400 Wh/kg

Source: Media, company IR, Samsung Securities

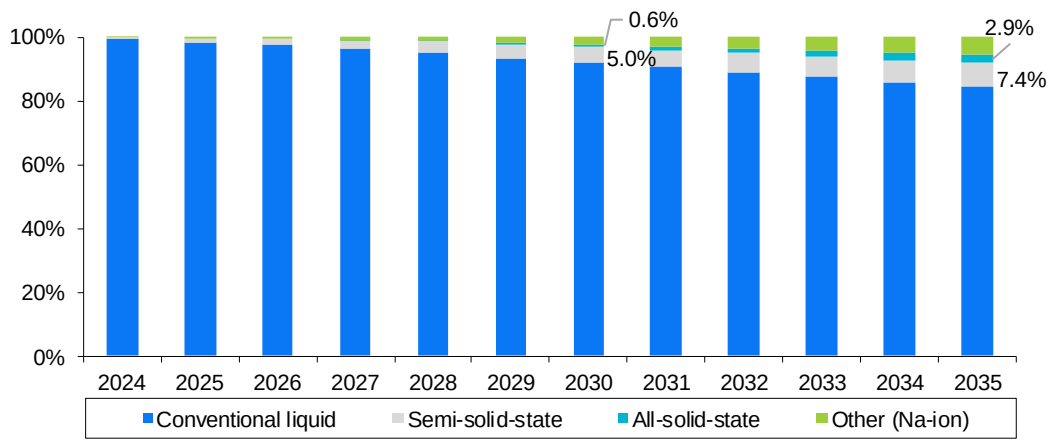
Semi-solid and solid-state batteries: Performance and cost estimates

	Conventional LiB	Semi-solid	Solid-state
Cost* (USD/kWh)	128-140	~280	520~
Energy density (Wh/kg)	150-260	360-500	450~
Stability	Low	Medium	High

Note: *Based on pack-level pricing (semi-solid data from Nio and CATL announcements)
Source: LG Business Research Institute (2024)

Issue 3. 2030 market share forecasts–All-solid-state at 0.6% and semi-solid-state at 5%: Despite the theoretical advantages of all-solid-state batteries, their growth trajectory should hinge on two factors: 1) the feasibility of mass-production at both the materials and dedicated-equipment levels; and 2) the existence of end markets capable of absorbing high initial development costs. BloombergNEF estimates that demand for all-solid-state batteries will reach 19 GWh by 2030, representing around 0.6% of a total market of roughly 3 TWh. By contrast, it projects demand for semi-solid-state batteries at 162 GWh in 2030, implying a 5% market share. This reflects: 1) their compatibility with existing production lines; and 2) the fact that, despite higher costs than liquid-electrolyte batteries, several factors support market penetration, including performance differentiation efforts by Chinese automakers, and government incentives for battery technology innovation.

Global: Projected breakdown of demand for solid-state and semi-solid state batteries



Source: BNEF, Samsung Securities

Implications for Korea's rechargeable battery industry: The recent rally in solid-state battery stocks, led by Samsung SDI, appears to have been driven by two factors: 1) heightened investor interest in humanoid robots following CES, which has lifted related stocks such as Hyundai Motor; and 2) the perception that solid-state batteries are a critical enabling technology for these robots, spurring investment across the value chain. That said, the technology remain at an early stage, and maturity and capital intensity required for commercial-scale production—particularly for humanoid robots—remain significant hurdles. We therefore advise caution toward follow-through buying of companies that lack solid fundamentals.

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