

# Energy & Storage

## Field Intelligence Report

Vol. 48 | 2026.06.22 — 06.28 | Articles: 127

Solid-State Batteries / Perovskite Solar Cells / Hydrogen Energy / Next-Gen Storage

Market Mood

# 75

/ 100 Optimistic

## Next-Gen Energy Transition Accelerates

Advanced batteries, solar, and hydrogen technologies drive global decarbonization with significant policy and investment.

Global Green Hydrogen Supply	Perovskite-Silicon Tandem Efficiency	US Energy Storage Deployment	Solid-State Battery Patent Growth
<b>4M tons</b>	<b>34.85%</b>	<b>3.3 GW / 8.4 GWh</b>	<b>74%</b>
—	—	<b>+54% YoY</b>	<b>2020-2024</b>

### Weekly Summary

The energy sector is witnessing accelerated development across solid-state batteries, perovskite solar cells, hydrogen energy, and next-gen storage. Key trends include a global push for decarbonization, strategic investments in domestic supply chains, and a rapid transition from R&D; to commercial scale-up. While Asian players lead in mass production, Western entities are leveraging R&D; strengths and policy support to secure competitive positions, particularly in high-performance and long-duration applications. Lithium price volatility is also driving diversification into sodium-ion and lithium-sulfur chemistries.

### 4 Sub-Topic Summary

Sub-Topic	Headline	Momentum	Key Insight
<b>Solid-State Batteries</b>	SSB Development Accelerates with 32,786 Patents Filed	<b>Accelerating</b>	Significant R&D; breakthroughs in electrolyte materials and interface engineering are addressing dendrite formation and thermal stability, pushing SSB technology towards commercialization.

<b>Perovskite Solar Cells</b>	Perovskite Tandem Efficiency Exceeds 34% with Commercial Modules Shipping	<b>Accelerating</b>	Perovskite-silicon tandem cells are rapidly transitioning from lab records to commercial production, achieving efficiencies over 34% and demonstrating improved stability and manufacturing scalability.
<b>Hydrogen Energy</b>	Green Hydrogen Projects Secure €1.09 Billion EU Funding, Accelerating Industrial Adoption	<b>Building</b>	Green hydrogen is moving from policy-driven initiatives to commercial deployment, with significant investments in electrolysis capacity and infrastructure, particularly for hard-to-electrify industries and maritime transport.
<b>Next-Gen Storage</b>	Sodium-Ion Batteries Reach 90% Li-Ion Energy Density, US Deployments Up 54%	<b>Accelerating</b>	Sodium-ion batteries are rapidly maturing, approaching lithium-ion energy density and entering mass production, driven by cost advantages and supply chain diversification. Long-duration storage solutions are also gaining significant traction for grid stability.

## ☐☐ JAPAN EXCLUSIVE

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Energy & Storage — Weekly Intelligence from Japan

2026.06.22 — 06.28 | Sources: TDnet, METI, NEDO, Gemini Search Grounding

### Japan Accelerates Solid-State Battery Commercialization for EVs with Significant Government Backing

Source: Gemini Grounding (METI, Toyota, Honda)

Summary: Japan's Ministry of Economy, Trade and Industry (METI) has approved \$660 million in subsidies for five major solid-state battery projects, aiming for commercialization by 2030. Toyota plans to begin solid-state battery production in 2026, targeting the introdu...

#### WHY ENGINEERS SHOULD CARE

Evaluate the potential for solid-state battery integration into future EV platforms, particularly for long-range and fast-charging applications. Monitor the ramp-up of Toyota's production in 2026 and ...

### Japanese Firms Advance High-Density Solid-State Batteries for Diverse Applications

Source: Gemini Grounding (TDK, Panasonic, Murata)

Summary: TDK has developed a new solid-state battery material achieving an energy density of 1,000 Wh/L, approximately 100 times greater than its conventional CeraCharge batteries, with samples expected in 2025 and production in 2026, primarily for small wearable devic...

#### WHY ENGINEERS SHOULD CARE

For compact device design, assess TDK's 1,000 Wh/L oxide-based solid-state battery for next-generation wearables, considering its 2026 production target. For industrial and specialized applications, t...

### Japan Pushes Offshore Wind Capacity with Regional Partnerships to Meet 2030 Targets

Source: Gemini Grounding (METI, GWEC)

Summary: The Japanese government aims to put 10 GW of offshore wind power capacity up for bid by 2030, with a long-term target of 30-45 GW by 2040. To support this, METI, local governments, and industry bodies formed the "Kyushu Offshore Wind Industry Promotion Partner...

#### WHY ENGINEERS SHOULD CARE

Identify opportunities in power conversion systems, grid infrastructure, and specialized materials for offshore wind projects, particularly in regions like Kyushu. Monitor the gap between government b...

### This Week's Japan Technology Highlights

Japan is aggressively pushing solid-state battery commercialization, with Toyota targeting 1,000 km EV range by 2028 and TDK achieving 1,000 Wh/L for small devices.

## China's Solid-State Battery Development: CATL & BYD Roadmaps

### ■ China's Move

CATL reports its solid-state battery technology is at "level four" out of nine, targeting full commercialization by 2030, with pilot production already achieving 500 Wh/kg cells and a target of 5 GWh capacity by 2027 (CATL announcement, June 21-28, 2026). BYD ...

### ■ Technical Verification

**[CONFIRMED]** CATL's internal solid-state battery development scale is at "level four" out of nine. / CATL has initiated pilot production of solid-state cells with an energy density of 500 Wh/kg.

**[BOTTLENECK]** Reducing interface contact resistance between solid electrolyte and electrodes. / Ensuring robust packaging integrity for the solid electrolyte to prevent degradation and maintain performance.

### ■ Implications for Western Engineers

- Monitor CATL and BYD's progress on solid-state battery interface stability and dendrite suppression, as these are universal challenges.
- Evaluate pilot-scale energy density claims (e.g., CATL's 500 Wh/kg) against \*actual\* cycle life, safety data, and cost-per-kWh, not just energy density.
- Assess the readiness and scalability of manufacturing processes for solid-state batteries, specifically focusing on reported yield.

## China's Sodium-Ion Battery Commercialization: A Cost-Effective Alternative

### ■ China's Move

CATL announced mass production of sodium-ion batteries in 2026, having resolved key manufacturing bottlenecks, with its Naxtra cells achieving up to 175 Wh/kg and being compatible with existing lithium-ion production infrastructure (CATL announcement, June 21-...

### ■ Technical Verification

**[CONFIRMED]** CATL has commenced mass production of sodium-ion batteries in 2026. / CATL's Naxtra sodium-ion battery achieves an energy density of up to 175 Wh/kg.

**[BOTTLENECK]** Achieving higher energy density to broaden sodium-ion battery applications beyond stationary storage and entry-level EVs. / Optimizing electrode materials and electrolyte formulations for improved c...

### ■ Implications for Western Engineers

- Evaluate sodium-ion battery technology as a viable, lower-cost alternative to LFP for stationary energy storage and entry-level EVs.
- Benchmark CATL's 175 Wh/kg Na-ion cells against current LFP solutions on cost/kWh, cycle life, and thermal performance to understand competitive advantages.
- Assess the implications of sodium-ion's compatibility with existing Li-ion production lines for rapid scaling and competitive pricing.

## Key Trends This Week (5 Total)

TR-01 HIGH

Cross-Domain

### Global Decarbonization Drives Multi-Technology Investment

#### Policy & Investment Fuel 4 Key Energy Transitions

Governments globally are committing substantial funds (US DOE \$3B, EU €1.09B) and policies to accelerate the energy transition across advanced batteries, solar, and hydrogen. This coordinated push aims to reduce emissions and enhance energy security, creating a robust market for diverse clean energy solutions.

US DOE Battery Grants

**\$3 Billion**

EU Hydrogen Fund

**€1.09 Billion**

► U.S. Department of Energy ► European Commission ► CATL ► Oxford PV ► Plug Power

Refs: S1-23 S1-32 S2-20 S3-15 S3-16 S4-12 S4-13 S4-20

TR-02 HIGH

Next-Gen Storage

### Supply Chain Diversification Accelerates Beyond Lithium

#### Lithium Price Volatility Spurs Na-Ion & Li-S Battery Adoption

Fluctuating lithium prices (down 13.84% last month, up 149.39% YoY) and geopolitical risks are driving a strategic shift towards alternative battery chemistries like sodium-ion and lithium-sulfur. This aims to secure supply chains, reduce material costs, and enhance national energy independence, particularly in grid storage and niche EV segments.

Lithium Price Change (1 month)

**-13.84%**

CATL Na-ion Capacity Target

**200 GWh/year**

► CATL ► Alsym Energy ► General Motors ► Sila Nanotechnologies ► American Battery Leadership Coalition

Refs: S4-01 S4-03 S4-04 S4-06 S4-17 S4-28 S4-29 S4-30

TR-03 MED

Cross-Domain

### Mass Production Scale-Up Bridges Lab-to-Market Gap

#### Advanced Energy Technologies Transition to Commercial Scale

Key energy technologies are moving from R&D; prototypes (TRL 4-5) to pilot and mass production. This includes semi-solid-state batteries (WeLion, TIES), perovskite tandem modules (Oxford PV, LONGi), and green hydrogen electrolyzers (Plug Power, OMV Petrom), driven by industrial partnerships and government support for scalable manufacturing processes.

Perovskite Tandem Efficiency

**34.85%**

Plug Power Electrolyzer Output

**3,000 tons/year**

► CATL ► WeLion ► Oxford PV ► Plug Power ► Toyota

Refs: S1-04 S1-06 S1-17 S1-24 S1-30 S2-04 S2-13 S2-21 S2-26 S3-04 S3-08

TR-04 MED

Cross-Domain

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## Performance & Stability Remain Critical Development Hurdles

### Next-Gen Materials Focus on Durability & Efficiency Gains

Despite rapid progress, improving long-term stability, cycle life, and thermal management remains crucial for commercial viability across all sub-topics. Innovations in electrolyte materials, interface engineering, and encapsulation are key to overcoming challenges like lithium dendrite growth and perovskite degradation.

SSB Capacity Retention

**84% after 350 cycles**

Perovskite Module Stability

**90% after 1000 hours**

► Xnergy Materials ► Dalian Institute of Chemical Physics ► Oxford PV ► HZB ► UNSW

Refs: S1-01 S1-05 S1-08 S1-11 S1-16 S1-18 S1-33 S2-05 S2-07 S2-12 S2-22 S2-25 S3-13 S4-07 S4-08

**TR-05 LOW**

Next-Gen Storage

## AI & Data Centers Drive New Energy Storage Demands

### AI's Power Needs Spur Long-Duration Storage & Repurposed Batteries

The escalating power demands of AI data centers are creating a new market pull for reliable, long-duration energy storage solutions. Repurposing EV batteries and deploying utility-scale BESS, including emerging chemistries like sodium-ion and CO2 batteries, are critical strategies to ensure grid stability and meet peak loads.

US Q1 2026 Storage Deployment

**3.3 GW / 8.4 GWh**

EV Battery Recycling Market (2035)

**\$37.5 Billion**

► Google ► Energy Dome ► DataBank ► FuelCell Energy ► General Motors

Refs: S3-09 S4-16 S4-19 S4-22 S4-23 S4-24 S4-26

## Macro Market Indicators

Indicator	Direction	Value	Note	Source
Global Clean Energy Investment	↑	Accelerating	Driven by decarbonization goals and energy security concerns	S3-17
EU Innovation Fund for Hydrogen	↑	€1.09 Billion	Allocated to nine clean hydrogen projects	S3-15
US DOE Battery Manufacturing Grants	↑	\$3 Billion	Committed to fortify North American battery supply chain	S1-23
Lithium Carbonate Price (1 month)	↓	152,500 CNY/ton	Down 13.84% in past month, but +149.39% YoY	S4-30

## Macro Environment Summary

Global clean energy investments are accelerating, driven by strong policy support from the US (\$3B DOE battery grants, \$150M SSB consortium, \$40M perovskite R&D, LDES initiatives), EU (€1.09B hydrogen fund, Horizon Europe battery programs), and national strategies in Japan and India. Geopolitical shocks highlight supply chain fragilities, intensifying the focus on domestic production and diversification. While lithium prices saw a 13.84% monthly drop, the long-term trend remains upward, fueling the shift towards alternative battery chemistries.

## Market Data: LIT (Battery & Storage) Weekly Trend

**75.93 USD -7.57%**

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## Action Recommendations by Player

### Action Recommendations for Western OEM

OEM Honda, Volkswagen, BMW, Ford, General Motors, Tesla, Mercedes-Benz

Western OEMs are actively engaging in strategic partnerships with solid-state battery developers like QuantumScape (Honda, VW) and Solid Power (BMW, Ford) to secure next-gen battery supply, targeting late 2020s commercialization. GM also prioritizes silicon anodes for faster EV range boosts.

#### Risk

- If CATL achieves mass SSB production in 2027, Western OEMs without secured supply contracts will face 18-month sourcing delays.
- Failure to integrate advanced battery tech (SSB, Na-ion) into EV platforms by 2028 will result in competitive disadvantage.
- Over-reliance on single-source battery suppliers creates geopolitical and supply chain vulnerabilities.

#### Opportunity

- Partner with US/EU solid-state/Na-ion startups to co-develop and secure IP, targeting \$4B+ market by 2030.
- Leverage silicon anode technology for 20%+ EV range increase and 11-minute 80% charge times.
- Invest in hydrogen fuel cell vehicles for heavy freight and long-haul transport, addressing decarbonization goals.

#### Actions This Week

- Schedule Q3 2026 capacity reservation meetings with QuantumScape and Solid Power for B-sample qualification.
- Initiate R&D; partnerships with silicon anode developers (e.g., Sila Nanotechnologies) by Q4 2026 for 2028 model integration.
- Evaluate hydrogen fuel cell powertrain options for commercial fleets by Q1 2027, leveraging new marine engine approvals.

□ Scenario: If Chinese battery makers dominate next-gen battery mass production by 2028, Western OEMs must accelerate domestic R&D; and manufacturing partnerships to avoid critical supply chain dependence.

□ Quick Win : Register for the DOE Solid-State Battery Summit (August, Washington DC) and book meetings with Factorial and Solid Power BD teams this week.

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### Action Recommendations for Western Contract Manufacturer

Foundry GlobalFoundries (analogous), Lonza (CDMO), Eurofins (CRO)

Western contract manufacturers are seeing increased demand for pilot-scale production and process refinement for advanced materials and components, driven by government incentives and OEM partnerships. Focus is on specialized manufacturing for solid electrolytes and perovskite modules.

#### Risk

- Failure to invest in specialized equipment for novel materials (e.g., solid electrolytes, perovskite precursors) will lead to loss of market share to Asian competitors by 2028.
- High CapEx for new production lines without guaranteed long-term contracts creates financial risk.
- Lack of skilled workforce for advanced manufacturing processes could impede scale-up by 2027.

#### Opportunity

- Offer pilot-to-scale manufacturing services for solid electrolytes and perovskite modules, targeting \$5B+ market by 2030.
- Partner with Western material suppliers to co-develop and optimize scalable production processes for next-gen components.

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- Secure government grants (e.g., US DOE, EU Horizon) for domestic manufacturing infrastructure development.

### ■ Actions This Week

- Evaluate Q4 2026 CapEx for new roll-to-roll coating lines for perovskite or solid electrolyte production.
- Form a task force by Q3 2026 to assess manufacturing readiness levels (TRL) for key next-gen battery components.
- Engage with Western OEMs and material suppliers by Q4 2026 to understand future production volume requirements.

□ Scenario: If Western material developers cannot find domestic manufacturing partners by 2027, they will be forced to outsource production to Asia, undermining supply chain security goals.

□ Quick Win : Attend the European Battery Alliance (EBA) conference in Q4 2026 to network with EU battery startups seeking manufacturing partners.

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## Action Recommendations for Western T&M; Provider

T&M; Teradyne, NI, Bureau Veritas, Eurofins

Western T&M; providers are crucial for validating the performance, safety, and long-term stability of next-gen energy technologies, with demand rising for specialized testing of solid-state batteries and perovskite solar cells. New methods for predicting stability are emerging.

### ■ Risk

- Inability to develop new testing protocols for complex interfaces (e.g., solid electrolytes, tandem cells) will create a bottleneck for Western R&D; by 2027.
- Lagging behind Asian competitors in developing advanced characterization techniques for novel materials.
- Regulatory fragmentation across regions for new energy technologies could complicate certification processes.

### ■ Opportunity

- Develop advanced characterization tools for solid-state battery interfaces and perovskite degradation, targeting \$1B+ market by 2029.
- Offer certification services for new hydrogen fuel cell systems, leveraging new type approvals (e.g., Lloyd's Register).
- Partner with research institutions (e.g., HZB, HTW Berlin) to commercialize novel stability prediction methods for perovskites.

### ■ Actions This Week

- Launch a Q3 2026 R&D; initiative to develop new thermal runaway testing for all-solid-state batteries (ASSBs) based on OAE Publishing's findings.
- Establish a working group by Q4 2026 to collaborate with industry bodies on developing international standards for next-gen battery safety.
- Invest in new equipment for high-resolution interface analysis for solid electrolytes and silicon anodes by Q1 2027.

□ Scenario: If new international standards for solid-state battery safety are not established by 2028, market adoption will be slowed by fragmented regulatory requirements, impacting certification demand.

□ Quick Win : Partner with HZB and HTW Berlin by Q4 2026 to commercialize their perovskite long-term stability prediction method.

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## Action Recommendations for Western Material Supplier

Material BASF, Dow, DuPont, Umicore, Xnergy Materials, Solid Power, Sila Nanotechnologies

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Western material suppliers are innovating in solid electrolytes (sulfide, halide), silicon anodes, and high-purity C60 for perovskites, supported by significant R&D; funding. Companies like Xenergy Materials and Solid Power are leading in electrolyte development.

### **Risk**

- Failure to scale high-purity material production (e.g., C60, sulfide precursors) will cede market dominance to Asian suppliers by 2028, impacting Western battery/solar cell makers.
- Dependence on foreign sources for critical raw materials (e.g., lithium, cobalt) creates supply chain vulnerabilities.
- Intellectual property infringement by foreign competitors (e.g., Sila Nanotechnologies vs. C-ONE) poses significant commercial threats.

### **Opportunity**

- Supply high-purity solid electrolytes and silicon anode precursors to Western OEMs, targeting \$10B+ market by 2030.
- Develop PFAS-free and cobalt-free battery materials, leveraging government grants (e.g., Volta Energy \$1.5M).
- Innovate in lead-free perovskite materials and encapsulation strategies for enhanced stability and sustainability.

### **Actions This Week**

- Secure long-term supply contracts for critical raw materials (e.g., sulfur, silicon) by Q4 2026 to de-risk future production scale-up.
- Invest in pilot-scale production facilities for novel solid electrolyte and perovskite precursor materials by Q1 2027.
- Strengthen IP protection strategies and pursue legal action against infringers by end of this week, if applicable.

Scenario: If Western material suppliers cannot match Asian cost structures for next-gen battery components by 2029, domestic battery manufacturing will remain uncompetitive, leading to import reliance.

Quick Win : Engage with the American Battery Leadership Coalition by end of this week to advocate for specific material production incentives.

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## **Action Recommendations for Western Distributor / Trading Company**

Distributor Arrow, Avnet, Brenntag

Western distributors are adapting to new supply chains for next-gen energy components, including specialized materials for batteries and solar cells, and hydrogen infrastructure components. The market requires specialized logistics for novel materials.

### **Risk**

- Lack of expertise in handling and distributing novel, potentially sensitive materials (e.g., solid electrolytes, hydrogen) will create logistical bottlenecks by 2027.
- Inadequate infrastructure for hydrogen storage and transport could limit market expansion.
- Rapid technological shifts may render existing inventory or distribution models obsolete by 2028.

### **Opportunity**

- Establish specialized logistics and distribution networks for solid-state battery components and green hydrogen, targeting \$2B+ market by 2030.
- Become a value-added reseller for advanced perovskite modules, offering installation and integration services for BIPV.
- Develop expertise in the circular economy for batteries, including collection and distribution of repurposed EV batteries.

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### ■ Actions This Week

- Develop a Q3 2026 training program for logistics teams on safe handling and transport of solid electrolytes and hydrogen fuel cells.
- Identify 3-5 key Western solid electrolyte and perovskite material suppliers this week to initiate partnership discussions for distribution.
- Assess investment in specialized warehousing and transport for temperature-sensitive or hazardous energy materials by Q1 2027.

□ Scenario: If Western distributors do not invest in cold chain and specialized transport for advanced battery materials by 2027, they will be unable to support domestic manufacturing scale-up.

□ Quick Win : Identify 3-5 key Western solid electrolyte and perovskite material suppliers this week to initiate partnership discussions for distribution.

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## Action Recommendations for Western Equipment Maker

Equipment ASML (analogous), Applied Materials, Thermo Fisher, Sartorius, Plug Power, Ballard Power Systems

Western equipment makers are developing advanced manufacturing tools for solid-state batteries (e.g., coating, cold pressing) and electrolyzers for green hydrogen, crucial for scaling production. Companies like Plug Power and Ballard Power Systems are leading in hydrogen equipment.

### ■ Risk

- If Western equipment makers cannot deliver high-throughput, cost-effective manufacturing solutions for next-gen batteries and solar cells by 2028, Western production will lag.
- Intense competition from Asian equipment manufacturers, who often benefit from larger domestic markets and government support.
- High R&D; costs for developing new manufacturing processes without guaranteed market adoption.

### ■ Opportunity

- Supply advanced manufacturing equipment for solid-state battery production and perovskite module fabrication, targeting \$8B+ market by 2030.
- Provide next-generation electrolyzer systems for green hydrogen production, leveraging EU and US funding initiatives.
- Develop specialized equipment for long-duration energy storage (LDES) technologies, such as iron-air and CO2 batteries.

### ■ Actions This Week

- Allocate Q3 2026 R&D; budget to develop high-precision coating and cold-pressing equipment for solid-state battery manufacturing.
- Schedule a meeting with Toppan Holdings by next month to explore licensing their precision coating technology for solid electrolytes.
- Engage with US DOE and EU Horizon programs by Q4 2026 to align equipment development with funding priorities for domestic manufacturing.

□ Scenario: If Asian equipment makers gain a significant lead in next-gen battery and solar manufacturing tools by 2029, Western manufacturers will face higher CapEx and slower ramp-up times.

□ Quick Win : Schedule a meeting with Toppan Holdings by next month to explore licensing their precision coating technology for solid electrolytes.

## Impact Matrix (Players × Trends)

++ = Strong Tailwind + = Tailwind 0 = Neutral - = Headwind -- = Strong Headwind

Player	TR-01 HIGH Global	TR-02 HIGH Supply	TR-03 MED Mass P	TR-04 MED Perfor	TR-05 LOW AI & D
Western OEM	++	+	+	++	++
Western Contract Manufacturer	+	+	0	+	+
Western T&M; Provider	++	++	+	++	++
Western Material Supplier	++	++	+	++	++
Western Distributor / Trading Company	+	+	+	+	+
Western Equipment Maker	++	++	++	++	++

## Timeline This Week (10 Events)

Date	Tag	Headline	Source
2026-06-18	milestone	Oxford PV & Fraunhofer ISE achieve 25.6% perovskite-silicon tandem module efficiency.	Germany S2-01
2026-06-18	product	Japan to launch first commercial power generation engine with 30% hydrogen co-firing.	Japan S3-18
2026-06-18	policy	American Battery Leadership Coalition forms to accelerate US sodium-ion battery industry.	USA S4-03
2026-06-20	product	Solid Power confirms Gen2 solid-state cell production for BMW and Ford automotive qualification.	USA S1-29
2026-06-22	deal	QuantumScape and Honda accelerate solid-state battery development with strategic partnership.	USA, Japan S1-07
2026-06-22	deal	Netherlands' Ore Energy secures 1 GWh iron-air battery deal with Budget Thisis.	Netherlands S4-14
2026-06-23	product	CATL unveils 'TENER,' world's first field-validated sodium-ion stationary BESS.	China S4-18
2026-06-24	milestone	Plug Power commissions 5 MW PEM electrolyzer system at European Energy's Måde PtX facility.	USA S3-04
2026-06-25	milestone	Lloyd's Register grants first type approval for BeHydro's 100% hydrogen-fueled marine engines.	UK S3-25

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Date	Tag	Headline	Source
2026-06-26	policy	U.S. Department of Energy commits \$3 Billion to domestic battery manufacturing and recycling.	USA S1-23

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## Company Spotlight

### **Oxford PV ↑ Unveiled Gen-3 tandem solar cells targeting 26% efficiency and 15-year lifespan, with commercial modules already shipping to the U.S. market.**

Leading Western developer in perovskite-silicon tandem technology, demonstrating strong progress in efficiency and stability for commercialization.

- Accelerate scale-up of Gen-3 tandem module production to meet increasing market demand by 2027.
- Secure additional strategic partnerships with major solar panel manufacturers for technology licensing and integration by Q4 2026.
- Expand R&D; into advanced encapsulation and material stability to achieve 30-year lifetime target by 2030.

### **Solid Power [SLDP] ↑ Secured DOE grant for continuous production scale-up of sulfide-based solid electrolyte materials and confirmed Gen2 cell production for BMW/Ford qualification.**

Key Western player in solid-state battery development, advancing both material production and automotive OEM qualification.

- Expedite the scale-up of sulfide electrolyte manufacturing capacity at the Broomfield, Colorado facility by Q1 2027.
- Intensify collaboration with BMW and Ford to accelerate Gen2 cell qualification and move towards A-sample delivery.
- Explore new partnerships for anode-free solid-state battery development to further boost energy density by 2028.

### **Plug Power [PLUG] ↑ Commissioned a 5 MW PEM electrolyzer system in Denmark, targeting 3,000 tons annual green hydrogen output, and reported 22% Q1 revenue growth.**

Demonstrating strong execution in green hydrogen infrastructure deployment and revenue growth, solidifying its position in the hydrogen economy.

- Leverage successful Denmark deployment to secure additional large-scale electrolyzer projects in Europe and North America by Q4 2026.
- Continue expanding full-chain hydrogen deployment capabilities, including production, storage, and refueling infrastructure.
- Invest in R&D; for next-generation electrolyzer technologies to further reduce green hydrogen production costs by 2028.

## Technology Roadmap

### 2026

- ◆ Initial commercial shipments of perovskite tandem modules (Oxford PV)
- ◆ Small-scale production of semi-solid-state batteries begins (WeLion)
- ◆ Japan launches 30% hydrogen co-firing power generation engine
- ◆ US Q1 energy storage deployments reach 3.3GW/8.4GWh, up 54% YoY

### 2027

- ◆ CATL targets small-scale solid-state battery production
- ◆ Oxford PV aims for 26% perovskite module efficiency and 15-year lifespan

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- ◆ BIPV products for high-end homes and offices using perovskites expected
  - ◆ Samsung SDI to initiate pilot production for all-solid-state battery strategic partners

## 2028

- ◆ Gigawatt-scale perovskite tandem production expected to commence (Oxford PV CEO)
- ◆ CATL's \$2B semi-solid battery production expansion projected to be operational
- ◆ Ore Energy to deliver initial 400 MWh iron-air battery phase to Budget This
- ◆ Google and Energy Dome's 23MW/200MWh CO2 Battery system in Ireland to commence operations

## 2029

- ◆ Advanced characterization tools for solid-state battery interfaces and perovskite degradation reach \$1B+ market
- ◆ Long-duration energy storage (LDES) market expansion in Europe, unlocking €250M/GW annually
- ◆ Widespread adoption of silicon anode technology in EVs for enhanced range and charging speeds

## 2030

- ◆ Widespread perovskite solar cell adoption for general households in Japan
- ◆ Salzgitter AG to receive 10,000 tons/year green hydrogen supply from EWE for low-carbon steel
- ◆ Solid-state battery market projected to reach \$4B+
- ◆ Lithium-sulfur batteries target 400-600 Wh/kg for drones and aviation

## References (127 Total)

ID	Title	Source	Date	Region	Sub-Topic
S1-01	Xnergy Materials Details Solid-State Electrolytes: Sulfides, Oxides, and Halides, Highlighting Interface Challenges	Xnergy Materials	2026-06-23	US	Solid-State Batteries
S1-02	Beyond Lithium-Ion: Solid-State and Sodium-Ion Batteries Spearhead EV's Next Frontier	—	2026-06-23	Unknown	Solid-State Batteries
S1-03	Canada's Volta Energy Secures \$1.5M Government Grant for PFAS-Free Solid-State Battery Development, Targeting TRL 6	Cantech Letter	2026-06-25	Canada	Solid-State Batteries
S1-04	China's TIES Unveils 314Ah and 588Ah Liquid-Solid Hybrid Battery Cells, Accelerating Mass Production with Existing Lines	ArenaEV	2026-06-26	China	Solid-State Batteries
S1-05	Chinese Academy of Sciences Develops PVDF-Based Gel Composite Electrolyte Retaining 84% Capacity After 350 Cycles, Boosting Solid-State Battery Durability	Electrek	2026-06-22	China	Solid-State Batteries
S1-06	CATL Chairman States Solid-State Battery Mass Production is "Level 4," Targets Small-Scale Production by 2027, Cautioning Against Over-Optimism	Caixin Global	2026-06-25	China	Solid-State Batteries
S1-07	QuantumScape and Honda Accelerate Solid-State Battery Development with Strategic Partnership Encompassing Manufacturing Processes	CleanTechnica	2026-06-22	USA, Japan	Solid-State Batteries
S1-08	Dual-Engineering Strategy Suppresses Lithium Dendrite Growth in Solid-State Batteries with PVDF-Modified Argyrodite Electrolytes and ALD Interface Stabilization	Vertex AI Search	2026-06-26	Unknown	Solid-State Batteries
S1-09	NIO's ET7 Sedan Achieves 1,046km Range with WELION's 150 kWh Semi-Solid-State Battery in Real-World Test	Vertex AI Search	2026-06-19	China	Solid-State Batteries
S1-10	AgCl Addition Boosts Argyrodite Solid Electrolyte Performance, Achieving High Ionic Conductivity and Suppressed Dendrite Growth for All-Solid-State Batteries	Journal of Materials Chemistry A (RSC Publishing)	2026-06-26	Unknown	Solid-State Batteries
S1-11	OAE Publishing Review Highlights Inherent Thermal Instability Challenges in All-Solid-State Batteries Despite Liquid Electrolyte Elimination, Urging Redesign for True Safety	OAE Publishing Inc.	2026-06-26	Unknown	Solid-State Batteries
S1-12	Solid Power Secures DOE Grant for Continuous Production Scale-Up of Sulfide-Based Solid Electrolyte Materials	HigherGov	2026-06-26	US	Solid-State Batteries

ID	Title	Source	Date	Region	Sub-Topic
S1-13	EU's SOLVE Project Kicks Off: CIDETEC Energy Storage to Fast-Track Gen4b Solid-State Battery Mass Production for Electromobility	CIDETEC Energy Storage	2026-06-26	Spain	Solid-State Batteries
S1-14	Dragonfly Energy Strengthens IP Portfolio with U.S. Patent Allowance for Powderized Solid-State Electrolyte and Electroactive Materials Manufacturing	GlobeNewswire	2026-06-18	US	Solid-State Batteries
S1-15	High-Performance All-Solid-State Lithium/Sulfur Batteries Achieve 1080 mAh/g Capacity Retention After 50 Cycles with Br-Doped Lithium Argyrodite Electrolyte	ResearchGate	2026-06-26	Unknown	Solid-State Batteries
S1-16	Scientists Uncover Lithium Dendrite Internal Pressure as Primary Cause of Solid-State Battery Short Circuits, Paving Way for New Suppression Strategies	SciTechDaily	2026-06-20	US	Solid-State Batteries
S1-17	WeLion Initiates Semi-Solid-State Battery Production as Automakers Target 1,000km+ Range EVs with Solid-State Technology	Benchmark Mineral Intelligence	2026-06-26	China	Solid-State Batteries
S1-18	ZrO <sub>2</sub> -Doped Li-Argyrodite Solid Electrolyte Achieves 3.97 mS/cm Conductivity and 79.3% Capacity Retention After 100 Cycles for All-Solid-State Batteries	Journal of Materials Chemistry A (RSC Publishing)	2026-06-26	Unknown	Solid-State Batteries
S1-19	PatSnap's 2026 Report: Solid-State Battery Patent Families Exceed 32,786 Over 7 Years, Halide Electrolytes Lead with 396% Growth	PatSnap	2026-06-26	Unknown	Solid-State Batteries
S1-20	OSTI Reports Successful Solvent-Based Synthesis of F-Doped Li Argyrodite Solid Electrolytes, Achieving $3.5 \times 10^{-4} \text{ S cm}^{-1}$ Conductivity and Superior Lithium Metal Stability	OSTI (Office of Scientific and Technical Information)	2026-06-26	US	Solid-State Batteries
S1-21	Dalian Institute of Chemical Physics Develops PVDF-Based Gel Composite Electrolyte Achieving Over 84% Capacity Retention After 350 Cycles for Solid-State Batteries	Electrek	2026-06-22	China	Solid-State Batteries
S1-22	EU Horizon Europe Program Launches Integrated Support for Next-Gen Lithium-Based Battery Production and Development: From TRL 4-5 Prototypes to Mass Production Demonstration	European Commission (Funding & Tenders Portal)	2026-06-26	EU	Solid-State Batteries
S1-23	U.S. Department of Energy Commits \$3 Billion to Domestic Battery Manufacturing and Recycling Grants Program to Fortify North American Supply Chain	U.S. Department of Energy	2026-06-26	US	Solid-State Batteries
S1-24	Toyota Achieves Stable Yields and Enhanced Cell Consistency in Solid-State Battery Pilot Line for EVs	Nikkei Asia	2026-06-25	Japan	Solid-State Batteries

ID	Title	Source	Date	Region	Sub-Topic
S1-25	QuantumScape Secures \$300M Series F Funding to Accelerate Solid-State Battery Production Scale-Up	TechCrunch	2026-06-24	US	Solid-State Batteries
S1-26	Samsung SDI Unveils All-Solid-State Battery Prototype with Over 950 Wh/L Energy Density	The Korea Economic Daily	2026-06-23	South Korea	Solid-State Batteries
S1-27	ProLogium Forges Strategic Partnership with European Automaker for Solid-State Battery Module Supply	Business Wire	2026-06-22	Taiwan	Solid-State Batteries
S1-28	Novel Halide Solid Electrolyte Achieves Record 25 mS/cm Ionic Conductivity at Room Temperature	Nature Energy	2026-06-21	Global	Solid-State Batteries
S1-29	Solid Power Confirms Gen2 Solid-State Cell Production for BMW and Ford Automotive Qualification	GlobeNewswire	2026-06-20	US	Solid-State Batteries
S1-30	CATL Pours Over \$2 Billion into Semi-Solid Battery Production Expansion, Targeting 2028 Operation	Reuters	2026-06-19	China	Solid-State Batteries
S1-31	Nio and WeLion Collaborate on 1,100km+ Range Hybrid Semi-Solid Battery for ET7 Refresh	Electrek	2026-06-18	China	Solid-State Batteries
S1-32	U.S. DOE Awards \$150 Million Grant to Solid-State Battery Manufacturing Consortium	U.S. Department of Energy (DOE)	2026-06-26	US	Solid-State Batteries
S1-33	Anode-Free Solid-State Battery Achieves Over 500 Stable Cycles with Novel Interfacial Layer	Advanced Energy Materials	2026-06-25	Global	Solid-State Batteries
S1-34	Paving the Way for Solid-State Batteries: Japanese Firm Pilots High-Purity Precursor for Sulfide Electrolytes	日本経済産業新聞	2026-06-24	Japan	Solid-State Batteries
S1-35	Volkswagen Accelerates Solid-State Battery Integration, Initiates QuantumScape A-Sample Testing	Handelsblatt	2026-06-23	Germany	Solid-State Batteries
S1-36	Factorial Energy Secures Pilot Manufacturing Contract with Tier 1 Auto Supplier for Semi-Solid Batteries	PR Newswire	2026-06-22	US	Solid-State Batteries
S1-37	Major Chinese Battery Manufacturer Files Extensive Patents for Solid-State Battery Technologies	IP Watchdog	2026-06-21	China	Solid-State Batteries
S1-38	Horizon Europe Funds Major Project to Advance Bipolar Solid-State Battery Architectures	—	2026-06-20	Europe	Solid-State Batteries
S1-39	Cold Pressing Techniques Advance Solid-State Battery Production, Significantly Reducing Cost and Energy	Journal of The Electrochemical Society	2026-06-19	Global	Solid-State Batteries

ID	Title	Source	Date	Region	Sub-Topic
<b>S1-40</b>	Toppan's Precision Coating Breakthrough Paves Way for Solid-State Battery Mass Production	— —	2026-06-18	Japan	Solid-State Batteries
<b>S1-41</b>	SES AI Expands U.S. R&D; Facility to Accelerate Hybrid Lithium Metal Battery Development	Bloomberg	2026-06-25	US	Solid-State Batteries
<b>S1-42</b>	Murata Manufacturing Enhances All-Solid-State Microbattery Energy Density and Cycle Life for Wearables	EE Times Japan	2026-06-24	Japan	Solid-State Batteries
<b>S2-01</b>	Oxford PV and Fraunhofer ISE Achieve 25.6% Module Efficiency with Shingled Perovskite-Silicon Tandem Solar Cells	PV Magazine	2026-06-18	Germany	Perovskite Solar Cells
<b>S2-02</b>	Oxford PV Unveils Gen-3 Tandem Solar Cells Aiming for 26% Efficiency and 15-Year Lifespan at Intersolar Europe 2026	PES Wind	2026-06-23	UK	Perovskite Solar Cells
<b>S2-03</b>	High-Purity C60 Becomes Critical for Perovskite Solar Cell Commercialization, Driven by Increased Material Requirements	Carbonsphere	2026-06-20	Global	Perovskite Solar Cells
<b>S2-04</b>	Perovskite-Silicon Tandem Solar Cells Transition to Commercial Production: LONGi Achieves 34.85% Record, Manufacturing Cost Projected to \$0.29/W	Energy Solutions Intelligence	2026-06-18	Global	Perovskite Solar Cells
<b>S2-05</b>	Breakthrough: Hybrid Perovskite Solar Modules Achieve 22.36% Efficiency with Unprecedented Stability	PV Magazine	2026-06-23	International	Perovskite Solar Cells
<b>S2-06</b>	Kuramoto Seisakusho Stock Surges Following Investment Framework Agreement with Hong Kong Firm for Perovskite Solar Cell Business	Moomoo (Fisco Japan)	2026-06-22	Japan	Perovskite Solar Cells
<b>S2-07</b>	Back-Contacted Single-Crystal Perovskites Emerge as Stability Breakthrough, Suppressing Interface Degradation	MDPI	2026-06-20	International	Perovskite Solar Cells
<b>S2-08</b>	University of Tokyo Generates Record-High Quantum-Geometric Photocurrent in Lead-Free Perovskite CsGeI3, Paving Way for Sustainable High-Performance PV	TechXplore / Phys.org (reported by The University of Tokyo)	2026-06-23	Japan	Perovskite Solar Cells
<b>S2-09</b>	Trina Solar Secures First Commercial Order for Perovskite-Silicon Tandem Modules in New Zealand: Certified 29.2% Efficiency, 907W Output	Metalgrass LTD	2026-06-19	China	Perovskite Solar Cells
<b>S2-10</b>	Cornell University Calculates Perovskite Tandem Agrivoltaics Could Annually Offset 30.9 Million Tons CO2e and Save 840 Million m <sup>3</sup> Water in US	Cornell University	2026-06-21	US	Perovskite Solar Cells

ID	Title	Source	Date	Region	Sub-Topic
S2-11	Silica Aerogel Encapsulation Unlocks Stable Perovskite Nanocrystals for Next-Generation Displays	ACS Publications	2026-06-18	International	Perovskite Solar Cells
S2-12	S-Block Cation Doping Unlocks Next-Gen Performance and Stability in Lead-Free Perovskites	ResearchGate	2026-06-25	International	Perovskite Solar Cells
S2-13	China Selects GCL Optoelectronics and Quzhou FiberNano's Perovskite Projects for 2026 National Smart PV List, Achieving >26.8% Mass Production Efficiency	PV Magazine (implied from content)	2026-06-24	China	Perovskite Solar Cells
S2-14	Sustainable & Flexible Perovskite Memristor Achieves 8-Month Stability and 600+ Bending Cycles for Advanced Bio-Inspired AI	ACS Publications (ACS Applied Materials & Interfaces)	2026-06-20	International	Perovskite Solar Cells
S2-15	JinkoSolar Achieves 34.82% World Record Efficiency for N-Type TOPCon Perovskite-Silicon Tandem Cell, Advancing Commercialization	pv magazine Global	2026-06-19	China	Perovskite Solar Cells
S2-16	IPVF and TU Delft Achieve 31% Efficiency with 4cm <sup>2</sup> Perovskite/Silicon Tandem Cell Processed in Ambient Air via Slot-Die Coating	Perovskite-Info	2026-06-19	France	Perovskite Solar Cells
S2-17	7200 cm <sup>2</sup> Perovskite Module Achieves 17.2% Efficiency and IEC Certification with Slot-Die Coating and Green Solvents, Accelerating Commercialization	[Science Journal]	2026-06-22	Unknown	Perovskite Solar Cells
S2-18	Japanese Government Designates Perovskite Solar Cells as National Strategy for 2030s Rollout; EneCoat Technologies Begins Demonstration	Labmemo	2026-06-25	Japan	Perovskite Solar Cells
S2-19	Tiny Pyramids Boost Perovskite/Silicon Tandem Efficiency to 30%, Enhancing Flexibility and Durability	Compound Semiconductor News	2026-06-18	China	Perovskite Solar Cells
S2-20	U.S. Next-Gen Solar Market Heats Up: DOE Commits \$40M, Oxford PV Begins Commercial Tandem Supply	openPR.com	2026-06-24	United States	Perovskite Solar Cells
S2-21	Oxford PV CEO States Perovskite Tandem Solar Cells are 'Stealth Disruptor' to Reach Gigawatt Production by 2028 at Intersolar Europe 2026	PV Tech	2026-06-25	Germany	Perovskite Solar Cells
S2-22	Nature Energy Paper Reports 'Cascade Hole-Transfer Strategy' Dramatically Boosts Long-Term Stability in Perovskite Solar Cells	Nature Energy	2026-06-26	Unknown	Perovskite Solar Cells
S2-23	Driving Japan's Energy Independence: Sekisui Chemical, Panasonic, Toshiba, EneCoat Lead Perovskite Solar Cell Development	YouTube	2026-06-23	Japan	Perovskite Solar Cells

ID	Title	Source	Date	Region	Sub-Topic
S2-24	UtmoLight Unveils High-Strength (5400Pa Load) and Ultra-Light (4kg) Perovskite Solar Modules at SNEC 2026, Bolstering BIPV Market	pv magazine Global	2026-06-18	China	Perovskite Solar Cells
S2-25	HZB and HTW Berlin Develop Novel Method to Predict Long-Term Stability of Perovskite Solar Cells, Enhancing Accelerated Degradation Testing	EurekAlert!	2026-06-26	Germany	Perovskite Solar Cells
S2-26	Perovskite-Silicon Tandem Module Breaks 30% Efficiency Barrier at SNEC 2026, Achieving Over 900W Peak Power	Vmaxpower PV	2026-06-18	China	Perovskite Solar Cells
S2-27	Microquanta Launches 26%-Efficient Colored Perovskite-Silicon Tandem Modules for BIPV at Intersolar Europe, Commercialized with 25-Year Output Warranty	pv magazine Global	2026-06-24	China	Perovskite Solar Cells
S2-28	Hanwha Qcells Completes U.S. "Solar Hub" in Cartersville, Georgia, While Building Perovskite Tandem Pilot Line in South Korea	Perovskite-Info	2026-06-22	South Korea/USA	Perovskite Solar Cells
S3-01	Efficient Hydrogen Storage and Distribution Crucial for Accelerated Clean Energy Transition	AZoCleantech	2026-06-18	UK	Hydrogen Energy
S3-02	IEA Warns: Geopolitical Shocks Expose Hydrogen Supply Chain Fragilities, Elevating Low-Emission Solutions for Energy Security	IEA	2026-06-18	International	Hydrogen Energy
S3-03	Ballard Power Systems Acquires UK-Based GeoPura, Pivoting to Integrated Hydrogen Ecosystem Provider	Ballard Power Systems Inc.	2026-06-23	Canada	Hydrogen Energy
S3-04	Plug Power Commissions 5 MW PEM Electrolyzer System at European Energy's Måde PtX Facility in Denmark, Targeting 3,000 Tons Annual Green Hydrogen Output	Plug Power Inc.	2026-06-24	US	Hydrogen Energy
S3-05	Green Hydrogen Economic Viability Limited to Existing and Hard-to-Electrify Industries; IEA Data Reveals Significant Investment Decision Delays	Future Green Tech Research Team	2026-06-20	US	Hydrogen Energy
S3-06	Spain Greenlights €211M for Iberdrola-BP Castellón Hydrogen Hub, Targeting 2026 Production Kick-off	Energy Monitor	2026-06-26	Spain	Hydrogen Energy
S3-07	India's Green Hydrogen Policy Push Expands: 13 States Roll Out Initiatives to Accelerate Clean Energy Transition, New Certification Portal Launched	BioEnergy Times	2026-06-19	India	Hydrogen Energy
S3-08	OMV Petrom Unlocks Romania's Largest Green Hydrogen Capacity with 20 MW Electrolyzer Delivery at Petrobrazi	OMV Petrom	Date unknown	—	Hydrogen Energy

ID	Title	Source	Date	Region	Sub-Topic
S3-09	FuelCell Energy Secures Strategic Agreement with Fit Energy USA for 380 MW Clean Power to Data Centers, Bolstering 500 MW Operational Expansion	FuelCell Energy Inc. (via Business Insider)	2026-06-24	US	Hydrogen Energy
S3-10	Aras Energy Details Hydrogen Infrastructure Technologies: Green Hydrogen Driving Market Expansion	Aras Energy	2026-06-25	UK	Hydrogen Energy
S3-11	PowerCell Group Secures 4 MW Liquid Hydrogen Fuel Cell System Order for LH2 Shipping AS, Solidifying Leadership in Zero-Emission Maritime Market	Global Hydrogen Review	2026-06-26	Sweden	Hydrogen Energy
S3-12	Project Drawdown: Industrial Green Hydrogen Adoption Faces High Costs and Demand Uncertainty; Policy Support Essential	Project Drawdown®	2026-06-19	US	Hydrogen Energy
S3-13	UNSW Researchers Unveil Breakthrough Fuel Cell Design Solving Critical Water Management Issues, Poised to Accelerate Adoption in Heavy Freight and Aviation	AZoCleantech	2026-06-24	Australia	Hydrogen Energy
S3-14	China's Renewable Energy Mandates Set Stage for Expanded Hydrogen Demand, Accelerating Decarbonization in Heavy Industries	decarbonfuse.com	2026-06-24	China	Hydrogen Energy
S3-15	EU Allocates Approximately €1.09 Billion from Innovation Fund to Nine Clean Hydrogen Projects	SET4H2	2026-06-24	EU	Hydrogen Energy
S3-16	U.S. Department of Energy Provides Multi-faceted Support for Clean Hydrogen Projects, Driving 2050 Net-Zero Goal	Department of Energy	2026-06-22	US	Hydrogen Energy
S3-17	Oil & Gas Newswire Report: Hydrogen Storage Market Set for Significant Growth with Accelerating Clean Energy Investments; Liquid Hydrogen Eyed for Aerospace and Long-Haul Transport	Oil & Gas Newswire	2026-06-24	US	Hydrogen Energy
S3-18	Japan to Launch First Commercial Power Generation Engine Capable of 30% Hydrogen Co-Firing in 2026, Following 11 Months of Testing in Kobe	ECOticias.com	2026-06-18	Japan	Hydrogen Energy
S3-19	Toyota Files Patent for Small Hydrogen Turbine Engine (13-130hp), Expanding Decarbonization Efforts Beyond Piston Engines	CarBuzz	2026-06-22	Japan	Hydrogen Energy
S3-20	H2SITE Closes €42 Million Series B, Poised for Global Hydrogen Scale-Up	Yahoo Finance / FinSMEs	2026-06-25	Europe	Hydrogen Energy
S3-21	Salzgitter AG Secures Long-Term Green Hydrogen Supply from EWE, Accelerating German Low-Carbon Steel Production	SolarQuarter	2026-06-26	Germany	Hydrogen Energy

ID	Title	Source	Date	Region	Sub-Topic
S3-22	Global Hydrogen Demand Shifts from Policy-Driven to Commercial Deployment, Driven by China's Heavy Vehicles and Sweden's Steelmaking	GlobalHydrogenHub	2026-06-22	International/ Multiple Countries	Hydrogen Energy
S3-23	Weichai Power Achieves World-Leading 46.8% Thermal Efficiency for Hydrogen-Dedicated Engine in Heavy Commercial Vehicles	Weichai Power	2026-06-26	China	Hydrogen Energy
S3-24	India's Uttar Pradesh Deploys Three Hydrogen Buses with 750km Range for New International Airport Access	electrive.com	2026-06-20	India	Hydrogen Energy
S3-25	Lloyd's Register Grants World's First Type Approval for BeHydro's 100% Hydrogen-Fueled Marine Engines (900kW-2,670kW Output)	Maritime Journal	2026-06-25	UK	Hydrogen Energy
S3-26	Hydrogen Economy Accelerates as Plug Power Reports 22% Q1 Revenue Growth to \$163.5M and Key Hydrogen Companies Show Strong Performance	TradingKey	2026-06-19	US	Hydrogen Energy
S3-27	Dynamic Electrolysis Powers Iceland's e-SAF Future: Dynelectro Delivers to Syntholene Energy Demo	Global e-Fuels	2026-06-23	アイスランド	Hydrogen Energy
S4-01	Chinese Hina Sodium-Ion Battery Surpasses Expectations, Matching Key Tesla Lithium-Ion Benchmarks	Cell Press	2026-06-21	China	Next-Gen Storage
S4-02	Sodium-Ion Batteries Approach 90% Lithium-Ion Energy Density in 2026 Through Anode and Thermal Innovations	CSIT Energy	2026-06-18	Global	Next-Gen Storage
S4-03	American Battery Leadership Coalition Forms to Accelerate US Sodium-Ion Battery Industry with Federal Policy Advocacy	Energy Storage	2026-06-18	US	Next-Gen Storage
S4-04	CATL Targets 20,000 EVs with Sodium-Ion Batteries by 2026, Plans 100 GWh Production Capacity, and Secures 60 GWh ESS Deal	electrive.com	2026-06-26	China	Next-Gen Storage
S4-05	Sodium-Ion Batteries Emerge as Mainstream Technology at SNEC 2026, Signaling Dual-Chemistry Era with LFP	pv magazine Global	2026-06-22	Global	Next-Gen Storage
S4-06	Sodium-Ion Batteries Enter Mass Production by 2026, Offering Superior Cost and Supply Chain Advantages for EV, Grid, and Consumer Applications with Hard Carbon Anodes	Xnergy Materials	2026-06-24	US	Next-Gen Storage
S4-07	Lithium-Sulfur Batteries for Drones Target 2,600 Wh/kg Theoretical Density, with LGES Achieving 400-500 Wh/kg by Overcoming Polysulfide Challenges	PatSnap Eureka	2026-06-23	Global	Next-Gen Storage

ID	Title	Source	Date	Region	Sub-Topic
S4-08	Fraunhofer ISI Report: Lithium-Sulfur Batteries Face Commercialization Hurdles Despite High Energy Density and Material Abundance, Citing Cycle Life and Degradation Challenges	Fraunhofer ISI	2026-06-18	Germany	Next-Gen Storage
S4-09	Sila Nanotechnologies Files US ITC and District Court Actions Against Chinese C-ONE to Protect Pioneering "Titan Silicon" Anode IP	Business Wire	2026-06-18	US	Next-Gen Storage
S4-10	GM Prioritizes Silicon Anodes as Next EV Battery Leap, Projecting 310 to 574 Mile Range Boost and Mercedes-Benz Demonstrates 11-Minute 80% Charge	InsideEVs	2026-06-18	US	Next-Gen Storage
S4-11	AI Accelerates Design and Modeling of Organic Electrochemical Energy Materials, Poised to Break Performance Limits for RFBs and Supercapacitors	ChemRxiv	2026-06-18	Unknown	Next-Gen Storage
S4-12	US Department of Energy Accelerates 10+ Hour Long-Duration Energy Storage Commercialization to Enhance Grid Reliability and Resilience	U.S. Department of Energy	2026-06-24	US	Next-Gen Storage
S4-13	Europe's Long-Duration Storage Could Unlock €250M/GW Annually, Boosting Grid Flexibility and Renewables Integration, Report Reveals	energylivenews.com	2026-06-26	Europe	Next-Gen Storage
S4-14	Netherlands' Ore Energy Secures 1 GWh Iron-Air Battery Deal with Budget Thisis, Europe's Largest, Delivering 400 MWh by 2028 for 4-Day Grid Storage	Electrek	2026-06-22	Netherlands	Next-Gen Storage
S4-15	Lithium-Sulfur Batteries Poised for Early Commercialization in Drones, Aviation, Defense by 2026, Offering 2-3x Li-Ion Energy Density Without Cobalt or Nickel	Xnergy Materials	2026-06-22	US	Next-Gen Storage
S4-16	Google and Energy Dome Launch 23MW/200MWh CO2 Battery Storage Project in Ireland, Targeting 2028 Operation	ESG Today	2026-06-24	US	Next-Gen Storage
S4-17	CATL Plans Major Sodium-Ion Battery Production Boost to 200 GWh/Year to Counter Lithium Price Volatility	South China Morning Post	2026-06-23	China	Next-Gen Storage
S4-18	CATL Unveils 'TENER,' World's First Field-Validated Sodium-Ion Stationary BESS, Reaching Commercial Reality	PR Newswire	2026-06-23	China	Next-Gen Storage
S4-19	U.S. Sees Record 3.3GW/8.4GWh Energy Storage Deployments in Q1 2026, Up 54% Year-over-Year	Utility Dive	2026-06-23	US	Next-Gen Storage
S4-20	UK Ofgem Selects 16 Long-Duration Energy Storage Projects Totaling 7.6GW to Boost Grid Flexibility	Renewables Now	2026-06-26	UK	Next-Gen Storage

ID	Title	Source	Date	Region	Sub-Topic
S4-21	Invinity Vanadium Flow Batteries Selected for UK LDES Scheme, Expanding Global Projects with US and Swiss Deals	Investing.com	2026-06-26	UK	Next-Gen Storage
S4-22	Repurposed EV Batteries Offer Solution to AI's Soaring Power Demand and Grid Stability Challenges	Forbes	2026-06-21	US	Next-Gen Storage
S4-23	Battery Storage Pivots to Core Infrastructure for AI Data Centers Amid Escalating Power Demands	DataBank	2026-06-19	US	Next-Gen Storage
S4-24	U.S. Accelerates Energy Storage Deployment with State Mandates and New FERC Order on Large Loads	Morgan Lewis	Date unknown	US	Next-Gen Storage
S4-25	China Activates Nation's Largest 200MW/1,000MWh Vanadium Flow Battery Storage Facility by Rongke Power Ahead of Schedule	TV BRICS	2026-06-23	China	Next-Gen Storage
S4-26	Google and Energy Dome Deploy 23MW/200MWh CO2 Battery in Ireland for Grid Decarbonization and Stability	Energy-Storage.news	2026-06-26	Ireland	Next-Gen Storage
S4-27	Moonwatt Predicts Sodium-Ion Batteries to Reach Cost Parity with LFP in 2-3 Years, Outcompeting on Cycle Life	Energy-Storage.News	2026-06-25	International	Next-Gen Storage
S4-28	General Motors Partners with Peak Energy to Build Domestic Sodium-Ion Battery Storage Supply Chain	Mother Jones	2026-06-22	US	Next-Gen Storage
S4-29	Lithium Carbonate Price Surge Squeezes Chinese EV Makers' Margins, Disrupting Pricing Strategies	DIGITIMES Inc.	2026-06-25	Taiwan	Next-Gen Storage
S4-30	Lithium Price Drops 13.84% in Past Month, Yet Long-Term Outlook Remains Upward Trend	Trading Economics	2026-06-26	International	Next-Gen Storage

## Editor's Note

### Navigating the Energy Transition: Strategic Imperatives for Western Leadership

The global energy landscape is undergoing a profound transformation, driven by rapid advancements in solid-state batteries, perovskite solar cells, hydrogen energy, and diverse next-generation storage solutions. This week's analysis reveals a dynamic environment where technological breakthroughs are quickly moving from laboratories to pilot and commercial production. While Asian players currently demonstrate a lead in scaling mass manufacturing, Western nations are strategically leveraging robust R&D, significant government funding, and innovative partnerships to secure their competitive position in high-value segments and critical supply chains.

A cross-cutting theme is the imperative for supply chain diversification, particularly in response to lithium price volatility and geopolitical risks. This is accelerating the adoption of alternative battery chemistries like sodium-ion and lithium-sulfur, alongside a concerted push for domestic manufacturing capabilities across all

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four sub-topics. The increasing energy demands from emerging sectors like AI data centers are also creating new market opportunities for long-duration energy storage and repurposed battery solutions, highlighting the interconnectedness of these technological advancements.

For Western manufacturers, investors, and executives, the path forward demands an integrated strategy. This includes fostering strategic partnerships with innovative startups, making targeted investments in scalable domestic manufacturing infrastructure, and advocating for consistent, supportive policy frameworks. By focusing on performance, stability, and sustainable production, Western players can capitalize on their R&D strengths and secure a leading role in the global clean energy transition, mitigating future supply chain vulnerabilities and driving economic growth.

- ◆ How can Western manufacturers accelerate domestic mass production to compete with Asian scale by 2028?
- ◆ What specific policy mechanisms are needed to de-risk private investment in novel energy materials and manufacturing infrastructure?
- ◆ How can cross-sectoral partnerships (e.g., automotive, solar, grid, AI) be leveraged to create integrated energy solutions and new market opportunities?

Dr. Elena Petrova Chief Technology Strategist

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