

# Energy & Storage

## Field Intelligence Report

Vol. 48 | 2026.06.15 — 06.21 | Articles: 165

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

Market Mood

# 65

/ 100 Cautious

## Next-Gen Energy: Commercialization Accelerates

Breakthroughs in batteries, solar, and hydrogen drive market readiness and strategic re-alignments.

Global Green Hydrogen Production (2025)	Perovskite-Silicon Tandem Cell Efficiency Record	Solid-State Battery EV Integration Target	Sodium-Ion Battery Cost Projection (2028)
<b>1 Million Tons</b>	<b>34.82%</b>	<b>2028</b>	<b>\$40-55</b>
+-%	+0.9%	-	-15%

### Weekly Summary

This week, the energy and storage domain saw significant strides towards commercialization across solid-state batteries, perovskite solar cells, hydrogen energy, and next-gen storage. Key developments include record-breaking solar efficiencies, accelerated battery production timelines, and critical infrastructure investments in hydrogen. Geopolitical factors and supply chain resilience continue to shape strategic decisions, with Western players focusing on domestic manufacturing and diversified sourcing to counter Asian dominance. The market mood is cautiously optimistic as technologies mature and policy support strengthens, but scalability and cost parity remain hurdles.

### 4 Sub-Topic Summary

Sub-Topic	Headline	Momentum	Key Insight
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<b>Solid-State Batteries</b>	Solid-State Battery Commercialization Accelerates with 2028 EV Targets	<b>Building</b>	Significant R&D; breakthroughs in electrolyte stability and ionic conductivity are pushing solid-state batteries closer to mass production, with Toyota targeting 2028 EV integration and Factorial Energy securing \$200M for commercialization. Challenges in low-temperature performance and manufacturing scalability persist, but strategic partnerships and government support (US DOE, EBA) are bolstering domestic supply chains.
<b>Perovskite Solar Cells</b>	Perovskite-Silicon Tandem Cells Break 34% Efficiency, Enter Commercial Production	<b>Accelerating</b>	Perovskite-silicon tandem solar cells achieved a new world record of 34.82% efficiency (JinkoSolar) and are entering commercial production (GCL Perovskite 500MW line by Q3 2026). This technology is redefining PV value proposition towards area efficiency, crucial for land-constrained regions. Stability, lead management, and manufacturing scale-up are key focus areas, with significant investments from China and pilot production in the US (Tandem PV).
<b>Hydrogen Energy</b>	Green Hydrogen Infrastructure Expands, Electrolyzer Durability Becomes Key Challenge	<b>Building</b>	Global green hydrogen projects are gaining momentum with significant infrastructure investments (NEOM 600 tons/day by 2027, Europe's North Adriatic Hydrogen Valley 200km pipeline). Electrolyzer technology is advancing, with PEM and AEM innovations, but the industry's focus is shifting from efficiency to durability and long-term operational reliability. Data center demand is driving fuel cell growth, while high costs and infrastructure gaps continue to hinder widespread adoption by 2030.

<p><b>Next-Gen Storage</b></p>	<p>Sodium-Ion Batteries Emerge as Cost-Effective Grid Solution, Recycling Gains Strategic Importance</p>	<p><b>Accelerating</b></p>	<p>Sodium-ion batteries are rapidly advancing towards commercialization, with costs projected to drop to \$40-55/kWh by 2028, making them a viable alternative to LFP for stationary storage. The American Battery Leadership Coalition is pushing for their designation as a US national priority. Battery recycling is elevated to a strategic resource by Europe and G7, targeting 25% recycled content by 2030, driving investments in advanced recycling technologies and second-life applications. Dry electrode manufacturing and silicon anodes are also gaining traction for cost and performance improvements.</p>
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## ☐☐ JAPAN EXCLUSIVE

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Energy & Storage — Weekly Intelligence from Japan

2026.06.15 — 06.21 | Sources: TDnet, METI, NEDO, Gemini Search Grounding

### TDK Achieves 1,000 Wh/L Solid-State Battery for Wearables

Source: TDnet/TDK, via Gemini Grounding

Summary: TDK Corporation has successfully developed a new oxide-based solid electrolyte material for solid-state batteries, achieving an energy density of 1,000 Wh/L. This represents a 100-fold increase over their conventional solid-state batteries and utilizes lithium...

#### WHY ENGINEERS SHOULD CARE

For designers of compact, high-power-density devices, TDK's 1,000 Wh/L solid-state battery offers a significant leap in energy storage. Evaluate this technology for next-generation wearables requiring...

### Panasonic Targets FY2027 for Anode-Free Solid-State Battery Samples, Boosts Li-ion Density

Source: TDnet/ HD, via Gemini Grounding

Summary: Panasonic Holdings plans to release samples of its new solid-state batteries by the fiscal year ending March 2027, initially focusing on industrial robots and high-temperature applications. Concurrently, the company is developing an "anode-free" technology pro...

#### WHY ENGINEERS SHOULD CARE

Technical planners should track Panasonic's solid-state battery sample availability for industrial and high-temperature applications. For EV battery procurement, monitor the anode-free technology's pr...

### Toyota Details 2027-2028 Solid-State EV Battery Commercialization with 1,000km Range

Source: Gemini Grounding / Recent Reports

Summary: Toyota's roadmap for solid-state EV battery commercialization targets the 2027-2028 timeframe, with initial models expected to offer a WLTP range of up to 621 miles (1,000 km) and a 10-80% DC fast-charge time of just 10 minutes. This initiative is supported by...

#### WHY ENGINEERS SHOULD CARE

EV powertrain engineers should factor Toyota's 2027-2028 solid-state battery timeline and performance targets (1,000 km range, 10-minute charge) into long-term design roadmaps. Supply chain profession...

### This Week's Japan Technology Highlights

TDK's 1,000 Wh/L solid-state battery breakthrough for wearables and Toyota's 1,000 km EV range target by 2028 highlight Japan's aggressive push in high-density energy storage.

## CATL and BYD Solid-State Battery Progress: Engineering Hurdles for Commercialization

### ■ China's Move

CATL, the world's largest battery producer, projects large-scale solid-state battery deployment post-2030, with small-series production by 2027 (Dr. Robin Zeng, CATL Chairman). Their all-solid-state chemistry is currently at Technology Readiness Level (TRL) 4 ...

### ■ Technical Verification

#### [CONFIRMED]

CATL's all-solid-state battery chemistry is at TRL 4 (laboratory validation/prototype engineering phases). / CATL has reported a 480 Wh/kg lithium-metal solid-state cell used in aerospace trials.

#### [BOTTLENECK]

Solid-solid interface stability: CATL identifies compaction density differences leading to structural misalignments, increased internal resistance, and accelerated cell degradation. BYD highlights g...

### ■ Implications for Western Engineers

- Battery R&D teams: Benchmark current solid-state interface engineering solutions against reported Chinese progress, particularly...
- EV powertrain engineers: Factor in the projected 2027-2030 timelines for limited/mass production of solid-state batteries when p...
- Materials scientists: Investigate the role of fluorine-containing lithium salts in sulfide-based electrolytes for stability enha...

## China's Dual-Track Export Controls: Critical Minerals and Battery Production Technology

### ■ China's Move

China implemented a new mineral resources law on June 15, 2026, strengthening strategic control over critical minerals (State Council). On June 18, 2026, China defended its export control measures on critical mineral supplies (China's Ministry of Commerce). Wh...

### ■ Technical Verification

#### [CONFIRMED]

A new mineral resources law, effective June 15, 2026, grants the State Council authority over critical mineral identification and control. / Export controls on \*technologies\* for LFP, LMFP, and phos...

#### [BOTTLENECK]

LFP/LMFP cathode manufacturing IP access: Western companies face a bottleneck in acquiring or independently developing the proprietary process technologies for efficient and high-quality LFP, LMFP, ...

### ■ Implications for Western Engineers

- Battery manufacturing engineers: Assess the feasibility and cost of developing proprietary LFP/LMFP cathode raw material prepara...
- Supply chain managers: Accelerate efforts to diversify sourcing for critical battery minerals (lithium, graphite) and LFP/LMFP p...
- Product development teams: Evaluate the long-term strategic implications of LFP/LMFP technology restrictions and consider altern...

## Key Trends This Week (5 Total)

TR-01 HIGH

Cross-Domain

### Global Supply Chains Reshape with 60% Critical Mineral Rule

**Western nations implement G7 '60% rule' and IRA to diversify critical mineral sourcing, countering China's dominance in battery and solar sectors.**

The G7's '60% rule' and the US IRA are driving a strategic shift in global supply chains, pushing Western countries to reduce reliance on single-country sources, particularly China, for critical minerals and advanced energy technologies. This is evident in calls for US-South Korea alliances on solid-state batteries (S1-10) and increased domestic manufacturing investments (S1-27, S4-22, S4-26, S4-52). The EU Battery Regulation also mandates sustainability and traceability, further transforming sourcing practices (S4-02, S4-58).

G7 Critical Minerals Rule

**60%**

EU Recycled Content Target

**25% by 2030**

► Western OEM ► Western Material Supplier ► Western Equipment Maker ► Western Distributor

Refs: S1-10 S1-27 S4-02 S4-22 S4-26 S4-40 S4-52 S4-58

TR-02 HIGH

Cross-Domain

### AI Data Centers Drive 4 GW Fuel Cell Demand, Grid Modernization

**Surging AI data center power demands accelerate adoption of hydrogen fuel cells (4 GW pipeline) and Virtual Power Plants (55-70 GW by 2026) for grid resilience.**

The exponential growth of AI computing is creating unprecedented demand for resilient and sustainable power, driving significant investment in hydrogen fuel cells and advanced energy storage. Fuel Cell Energy's commercial sales pipeline surged 267% to 4 GW, with 90% from data centers (S3-26). Bloom Energy's SOFC solutions are also seeing massive growth (S3-27). Concurrently, Virtual Power Plants (VPPs) are gaining traction (55-70 GW by 2026) to stabilize grids and integrate distributed resources, offering a cheaper alternative to peaker plants (S4-28, S4-33, S4-44, S4-46, S4-53).

Fuel Cell Energy Pipeline

**4 GW**

VPP Capacity Forecast

**55-70 GW by 2026**

► Western OEM ► Western Equipment Maker ► Western T&M; Provider

Refs: S3-26 S3-27 S3-46 S4-01 S4-28 S4-33 S4-35 S4-36 S4-39 S4-44 S4-46 S4-53

TR-03 MED

Next-Gen Storage

### Sodium-Ion Batteries Target \$40/kWh by 2028, Diversifying Storage

**Sodium-ion batteries emerge as a cost-effective alternative, projected to reach \$40-55/kWh by 2028, while silicon anodes and dry electrode manufacturing enhance performance and sustainability.**

The battery market is diversifying beyond traditional lithium-ion, with sodium-ion batteries gaining significant traction for stationary storage due to lower costs (\$40-55/kWh by 2028) and abundant materials (S4-03, S4-07, S4-09, S4-21, S4-59). Silicon anode technology is also rapidly advancing to boost EV range and

charging speed, preceding solid-state commercialization (S4-24, S4-34, S4-45, S4-47). Furthermore, solvent-free dry electrode manufacturing is poised to slash production costs and environmental impact (S4-23, S4-25, S4-32, S4-48), driving sustainable battery production.

Sodium-Ion Cost Target

**\$40-55/kWh by 2028**

LFP Battery Cost Phase

**New Phase in 2026**

► Western OEM ► Western Material Supplier ► Western Equipment Maker

Refs: S4-03 S4-07 S4-09 S4-21 S4-23 S4-24 S4-25 S4-32 S4-34 S4-37 S4-45 S4-47 S4-48 S4-59

TR-04 MED

Hydrogen Energy

## Hydrogen Industry Shifts Focus to Electrolyzer Durability

**Hydrogen industry prioritizes electrolyzer durability over efficiency, as global infrastructure projects (e.g., NEOM, EU Hydrogen Valley) advance despite high costs.**

The hydrogen industry is shifting its primary technical challenge from electrolyzer efficiency to durability and long-term operational reliability (S3-36). Major manufacturers are focusing on fleet monitoring and digital services. Concurrently, significant infrastructure projects are progressing globally, such as NEOM's 600 tons/day green hydrogen plant by 2027 (S3-11, S3-45) and Europe's North Adriatic Hydrogen Valley with a 200km pipeline (S3-24). However, high costs and infrastructure gaps continue to hinder widespread adoption, as noted by the IEA (S3-20).

NEOM Green Hydrogen Output

**600 tons/day by 2027**

Global Hydrogen Demand (2025)

**100 Million Tons**

► Western Equipment Maker ► Western Material Supplier ► Western OEM

Refs: S3-09 S3-11 S3-12 S3-19 S3-20 S3-24 S3-36 S3-41 S3-45

TR-05 LOW

Perovskite Solar Cells

## Perovskite Solar Eyes Space & Agrivoltaics with 30% Efficiency

**Perovskite solar cells, achieving over 30% efficiency, are exploring high-value niche markets like space power and agrivoltaics, promising CO2 and water savings.**

Beyond terrestrial utility-scale applications, perovskite solar cells are demonstrating significant potential in high-value niche markets. Their high efficiency (over 30% for tandem cells, S2-05, S2-11) and lightweight properties make them ideal for space applications, with China and South Korea intensifying their race for space solar (S2-12, S2-14, S2-18). Additionally, integrating perovskite tandem PV into agrivoltaics could offset 30.9 million tons of CO2 and save 8.4 billion m<sup>3</sup> of water annually (S2-06), highlighting a path for sustainable coexistence of food and energy production.

Agrivoltaics CO2 Offset

**30.9 Million Tons CO2**

Agrivoltaics Water Savings

**8.4 Billion m<sup>3</sup> Water**

► Western OEM ► Western Material Supplier

Refs: S2-06 S2-09 S2-12 S2-14 S2-18

## Macro Market Indicators

Indicator	Direction	Value	Note	Source
US IRA Tax Credit Monetization	↑	\$39.2 Million	Plug Power's sale of federal investment tax credits for immediate liquidity.	Simply Wall St
EU Critical Raw Materials Act Target	↑	25%	Target for annual strategic raw material demand from recycling by 2030.	MiningSEE 他
G7 Critical Minerals '60% Rule'	→	60%	Proposed rule to reduce over-reliance on single-country sources for critical minerals.	Skilling's Mining Review
Global Hydrogen Demand (2025)	↑	100 Million Tons	IEA report highlights demand exceeding 100 million tons, but low-emission supply lags.	IEA

## Macro Environment Summary

Global energy transition efforts are intensifying, driven by policy incentives like the US IRA and EU Critical Raw Materials Act, which are reshaping supply chains and fostering domestic production. Geopolitical competition, particularly with China, is accelerating strategic alliances and investments in next-gen technologies. While demand for green energy solutions like hydrogen is high (100M tons in 2025), high costs and infrastructure gaps persist, necessitating continued policy support and technological breakthroughs for 2030 targets.

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

**82.15 USD -0.27%**

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## Action Recommendations by Player

### Action Recommendations for Western OEM

OEM BMW, General Motors, Mercedes-Benz, Volkswagen, Waymo

Western OEMs like BMW and GM are actively investing in solid-state (BMW with Solid Power, VW with QuantumScape) and silicon anode batteries (GM with Sila Nanotechnologies) to secure next-gen EV performance by 2028. Mercedes-Benz will deploy hydrogen fuel cell trucks by Dec 2026 with Dachser (S3-01, S3-38).

#### Risk

- If Chinese CATL achieves 2027 SSB mass production, Western OEMs without secured supply contracts will face 18-month sourcing delays
- Failure to diversify critical mineral supply chains will lead to increased costs and production halts by 2028
- Delayed adoption of sodium-ion for stationary storage could cede market share to Asian competitors by 2027

#### Opportunity

- Partner with US/EU solid-state battery developers (Factorial, Solid Power) to secure 2028 EV integration and gain 12-month lead
- Invest in silicon anode technology (Sila Nanotechnologies, Amprius) for 2026-27 EV models to boost range and charging speed
- Pilot hydrogen fuel cell trucks (Daimler Truck) for long-haul logistics by Q4 2026, gaining early operational data

#### Actions This Week

- Schedule Q3 2026 meetings with Factorial Energy and Solid Power to finalize 2028 SSB supply agreements
- Initiate R&D; partnerships with Sila Nanotechnologies for silicon anode integration into 2027 EV platforms by next month
- Evaluate Daimler Truck's NextGenH2 for Q4 2026 pilot deployment in European logistics operations this week

□ Scenario: If Chinese battery manufacturers achieve mass production of solid-state or advanced sodium-ion batteries by 2027, then Western OEMs must accelerate domestic R&D; and secure diversified supply chains to avoid significant market share loss and technology dependence.

□ Quick Win : Engage with Factorial Energy and Solid Power this week to explore joint development and pilot programs for 2028 solid-state EV integration.

### Action Recommendations for Western Contract Manufacturer

Foundry GlobalFoundries, Lonza

Western contract manufacturers face increasing demand for advanced battery and electrolyzer component production, driven by domestic supply chain initiatives (US DOE, EU Battery Regulation). Opportunities exist in dry electrode manufacturing and specialized material processing, but scaling up new technologies presents significant capital and technical challenges.

#### Risk

- Lack of specialized equipment for solid-state battery or advanced electrolyzer production will result in lost contracts by 2027
- Inability to meet stringent EU/G7 recycled content mandates will exclude from key markets by 2030
- High capital expenditure for new production lines without guaranteed long-term contracts creates financial strain

#### Opportunity

- Develop expertise in dry electrode manufacturing (Imperial College London, LiCAP) to capture \$X billion market by 2028 with lower CapEx
- Offer pilot production services for solid-state battery components to Western OEMs and material suppliers by Q1 2027
- Partner with electrolyzer manufacturers (Plug Power, ITM Power) to scale PEM/AEM component production for 2027-28 demand surge

#### ■ Actions This Week

- Allocate Q3 2026 R&D; budget to pilot dry electrode manufacturing processes, targeting 20% cost reduction by Q4
- Engage with Factorial Energy and Solid Power by end of month to assess pilot line needs for 2027 solid-state battery components
- Conduct feasibility study on scaling PEM electrolyzer component production by Q4 2026, identifying key equipment suppliers

□ Scenario: If Western OEMs and material suppliers accelerate domestic production of next-gen batteries and hydrogen components, then Western contract manufacturers must invest in specialized, scalable manufacturing capabilities by 2027 to avoid being bypassed by integrated Asian players.

□ Quick Win : Research and contact Imperial College London and LiCAP Technologies this week to explore licensing or partnership for dry electrode manufacturing.

## Action Recommendations for Western T&M; Provider

T&M; TÜV SÜD, TÜV Rheinland, Bureau Veritas

Western T&M; providers are critical enablers for commercializing next-gen energy technologies, particularly in battery safety (UK BESS guidelines, NYSERDA) and solar efficiency verification (TÜV SÜD, TÜV Rheinland for Trinasolar). Demand for certification and quality control is surging as new products enter mass production and regulatory frameworks evolve.

#### ■ Risk

- Failure to adapt testing protocols for new battery chemistries (sodium-ion, solid-state) will lead to market irrelevance by 2027
- Inadequate capacity to handle increased demand for perovskite solar cell certification will create bottlenecks by 2026
- Lack of expertise in hydrogen infrastructure safety standards (e.g., 700 bar stations) will limit market access by 2027

#### ■ Opportunity

- Develop specialized testing and certification services for solid-state and sodium-ion batteries to capture \$X billion market by 2028
- Expand capacity and expertise for perovskite solar cell efficiency and durability testing (e.g., 34.82% record) by Q4 2026
- Offer safety and performance validation for hydrogen electrolyzers and fueling infrastructure (e.g., 700 bar stations) by Q1 2027

#### ■ Actions This Week

- Launch internal task force by end of week to develop new testing standards for sodium-ion and solid-state battery safety and performance
- Allocate Q3 2026 resources to train engineers on perovskite solar cell characterization and module certification protocols
- Engage with hydrogen infrastructure developers (HTEC, ORLEN) by next month to offer safety and compliance services for new fueling stations

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□ Scenario: If new energy technologies like solid-state batteries and perovskite solar cells achieve mass production by 2028, then T&M; providers must proactively develop and standardize new testing and certification methodologies to ensure safety and market trust, or risk becoming a bottleneck.

□ **Quick Win** : Review UK BESS fire safety guidelines and NYSERDA regulations this week to identify gaps and develop new service offerings for Q3 2026.

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## Action Recommendations for Western Material Supplier

Material Albemarle, Umicore, BASF, Dow, DuPont

Western material suppliers are crucial for securing diversified supply chains for next-gen batteries and hydrogen production. Companies like Albemarle are investing in lithium extraction (S1-25), while Umicore is developing cathode materials for solid-state EVs (S1-26). Opportunities abound in solid electrolytes, silicon anodes, and advanced materials for electrolyzers, but competition from Asian players is intense.

### Risk

- Failure to secure diversified critical mineral sources will lead to supply chain disruptions and cost volatility by 2027
- Slow R&D; in solid electrolytes and silicon anode materials will cede market leadership to Asian competitors by 2028
- Inability to meet demand for high-purity materials for green hydrogen production will limit growth by 2027

### Opportunity

- Develop and scale production of high-purity solid electrolytes (sulfide, halide, polymer) for solid-state batteries to capture \$4B+ market by 2030
- Invest in silicon anode material production (Sila Nanotechnologies, Amprius) to supply fast-growing EV market by 2027
- Supply advanced materials for PEM and AEM electrolyzers (e.g., iridium alternatives) to meet surging green hydrogen demand by 2028

### Actions This Week

- Initiate R&D; project by Q3 2026 to develop next-gen halide solid electrolytes with improved ionic conductivity and stability
- Evaluate strategic partnerships with silicon anode developers (Sila Nanotechnologies, Group14) for joint material scaling by Q4
- Assess current production capacity for high-purity materials for PEM electrolyzers and plan 2027 expansion by next month

□ Scenario: If Western OEMs commit to domestic battery and hydrogen production, then Western material suppliers must rapidly scale R&D; and manufacturing of advanced materials (solid electrolytes, silicon anodes, electrolyzer components) by 2027 to meet demand and avoid reliance on foreign sources.

□ **Quick Win** : Contact Factorial Energy and Solid Power this week to understand their specific solid electrolyte material needs for 2028 EV targets.

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## Action Recommendations for Western Distributor

Distributor Arrow Electronics, Avnet, Brenntag

Western distributors play a vital role in connecting emerging technology developers with end-users, particularly for specialized materials (Targray for lithium metal foil) and components. The shift towards diversified supply chains and domestic manufacturing creates new opportunities for value-added services, but also requires adapting to new product lines and complex regulatory environments.

### Risk

- Inability to source and distribute specialized materials for next-gen batteries (e.g., solid electrolytes, silicon anodes) will lead to market share erosion by 2027
- Lack of expertise in handling and transporting hydrogen-related components (e.g., electrolyzers, fuel cells) will limit market entry by 2028
- Failure to comply with new EU/G7 traceability and sustainability mandates for battery materials will result in penalties by 2030

### Opportunity

- Establish specialized distribution channels for solid-state battery components and materials (e.g., high-purity lithium metal foil) by Q1 2027
- Develop logistics and supply chain solutions for hydrogen electrolyzers and fuel cell systems to support infrastructure build-out by 2028
- Offer value-added services (e.g., inventory management, technical support) for perovskite solar cell components to new manufacturers by Q3 2026

### Actions This Week

- Conduct market research by end of month to identify key Western solid-state battery material suppliers and their distribution needs
- Develop a training program for logistics teams on safe handling and transport of hydrogen components by Q4 2026
- Engage with emerging perovskite solar manufacturers (Oxford PV, Tandem PV) this week to offer supply chain support for commercialization

□ Scenario: If Western manufacturing of next-gen energy technologies scales rapidly by 2028, then Western distributors must proactively build specialized supply chain capabilities for new materials and components, or risk becoming obsolete in a rapidly evolving market.

□ Quick Win : Identify 3-5 key Western solid-state battery material startups and schedule introductory meetings this week to explore distribution partnerships.

## Action Recommendations for Western Equipment Maker

Equipment Applied Materials, ASML, Thermo Fisher, Sartorius

Western equipment makers are crucial for enabling mass production of next-gen energy technologies. ULVAC is developing thin-film deposition equipment for solid electrolytes (S1-32), while companies like Ohmium International are scaling PEM electrolyzer gigafactories (S3-14). The demand for advanced manufacturing tools for solid-state batteries, perovskite solar cells, and green hydrogen electrolyzers is rapidly increasing.

### Risk

- Failure to develop high-throughput, cost-effective manufacturing equipment for solid-state batteries will delay commercialization by 2028
- Inability to provide scalable deposition and interconnection equipment for perovskite tandem solar cells will cede market to Asian competitors by 2027
- Slow innovation in electrolyzer manufacturing equipment will hinder green hydrogen cost reduction targets by 2028

### Opportunity

- Develop and supply advanced thin-film deposition equipment for solid electrolyte mass production to capture \$X billion market by 2028
- Innovate manufacturing equipment for perovskite-silicon tandem solar cells (e.g., slot-die coating, shingling) to support 30%+ efficiency modules by 2027
- Provide modular, scalable electrolyzer manufacturing equipment (e.g., for PEM, AEM) to meet 2-4 GW gigafactory demand by 2028

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## ■ Actions This Week

- Accelerate R&D; on next-gen thin-film deposition equipment for solid electrolytes, targeting 20% cost reduction by Q3 2027
- Engage with Oxford PV and Fraunhofer ISE this week to understand equipment needs for 25.6% efficient shingled perovskite modules
- Present scalable PEM electrolyzer manufacturing solutions to Plug Power and ITM Power by next month to support their capacity expansion plans

□ Scenario: If next-gen energy technologies like solid-state batteries and perovskite solar cells achieve commercial viability by 2028, then Western equipment makers must deliver high-precision, high-throughput, and cost-effective manufacturing solutions to enable mass production and compete with Asian suppliers.

□ Quick Win : Schedule a technical deep-dive with Factorial Energy and Solid Power this week to identify critical equipment bottlenecks for their pilot production lines.

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## Impact Matrix (Players × Trends)

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

Player	TR-01 HIGH Global	TR-02 HIGH AI Dat	TR-03 MED Sodium	TR-04 MED Hydrog	TR-05 LOW Perovs
Western OEM	++	+	++	++	++
Western Contract Manufacturer	+	0	+	+	+
Western T&M; Provider	++	++	++	++	++
Western Material Supplier	++	+	++	++	++
Western Distributor	+	+	+	+	+
Western Equipment Maker	++	++	++	++	++

## Timeline This Week (10 Events)

Date	Tag	Headline	Source
2026-06-11	product	StoreDot unveils ultra-fast charging solid-state battery prototype	International S1-22
2026-06-15	milestone	Toyota targets 2028 for EV integration of solid-state batteries	Japan S1-14
2026-06-16	product	GCL Perovskite announces commercial module shipments by Q3 2026	China S2-03
2026-06-16	deal	Energy Dome & SRP deploy 19MW CO2 battery for Arizona grid by 2029	USA S4-01
2026-06-17	deal	Factorial Energy secures \$200M Series D for SSB commercialization	USA S1-13
2026-06-18	milestone	JinkoSolar achieves 34.82% world record for perovskite-silicon tandem cell	China S2-02
2026-06-18	product	Daimler Truck's NextGenH2 fuel cell truck to be deployed by Dachser by Dec 2026	Germany S3-01, S3-38
2026-06-18	policy	American Battery Leadership Coalition launches for sodium-ion priority	USA S4-03
2026-06-19	policy	India's National Green Hydrogen Mission secures 670,000 MTPA green ammonia	India S3-08

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Date	Tag	Headline	Source
2027	milestone	NEOM green hydrogen plant targets 600 tons/day commercial production	Saudi Arabia S3-11, S3-45

## Company Spotlight

### Factorial Energy [Private] ↑ \$200M Series D Funding

Secured significant funding to accelerate solid-state battery commercialization for EVs, establishing a US pilot line with DOE support.

- Western OEMs: Engage Factorial for 2028 SSB supply contracts by Q3 2026.
- Western Investors: Monitor next funding rounds and production milestones for early entry.

### JinkoSolar [JKS] ↑ 34.82% Perovskite Tandem Efficiency Record

Achieved a new world record for N-type TOPCon perovskite tandem solar cell efficiency, setting a new benchmark for the industry.

- Western Solar Developers: Evaluate JinkoSolar's tandem modules for high-efficiency projects by Q4 2026.
- Western Equipment Makers: Analyze JinkoSolar's innovations to develop compatible manufacturing tools.

### Plug Power [PLUG] ↑ Electrolyzer Sales Surge 345%

Q1 2026 revenue grew 22% YOY, driven by a 345% surge in electrolyzer sales, boosting liquidity through IRA tax credit sales.

- Western Investors: Assess long-term profitability targets (2028) against ongoing cash burn concerns.
- Western OEMs: Explore partnerships for green hydrogen supply to decarbonize operations by 2027.

## Technology Roadmap

### 2026

- ◆ Perovskite-silicon tandem modules begin commercial shipments (GCL Perovskite)
- ◆ Mercedes-Benz NextGenH2 fuel cell trucks deployed
- ◆ VPP market reaches 55-70 GW

### 2027

- ◆ NEOM green hydrogen plant achieves 600 tons/day production
- ◆ Sodium-ion battery costs become competitive for stationary storage
- ◆ Electrolyzer durability becomes primary R&D; focus

### 2028

- ◆ Toyota targets solid-state battery integration in EVs
- ◆ Sodium-ion battery costs projected to drop to \$40-55/kWh
- ◆ POSCO launches HyREX pilot plant for hydrogen steelmaking

### 2029

- ◆ ProLogium's European solid-state battery gigafactory commences operations
- ◆ Energy Dome's 19MW CO2 battery system deployed in Arizona

### 2030

- ◆ EU targets 25% recycled content for strategic raw materials
- ◆ Nederlandse Gasunie invests €4 billion in hydrogen network
- ◆ IEA warns 2030 low-emission hydrogen targets are challenging

## References (165 Total)

ID	Title	Source	Date	Region	Sub-Topic
S1-01	Solid-State Batteries for Robotics: Highlighting >400 Wh/kg Energy Density and Diverse Solid Electrolyte Applications	Frontiers in Batteries and Electrochemistry	2026-06-12	International	Solid-State Batteries
S1-02	IMLB 2026: Advances in Solid-State Battery Electrolytes Achieve Enhanced Ionic Conductivity and Stability	IMLB Meeting	2026-06-18	International	Solid-State Batteries
S1-03	Solid-State Batteries Offer 6x Faster Charging, High Energy Density, Face Low-Temperature Performance and Lifespan Hurdles	SINEXCEL-RE	2026-06-11	US	Solid-State Batteries
S1-04	Solid-State Batteries Propel Robotics into Extreme Environments, Offering Unprecedented Safety and Performance		2026-06-12	Unknown	Solid-State Batteries
S1-05	MDPI Study Compares Synthesis Methods for High-Stability Halide Solid Electrolyte $\text{Li}_3\text{In}_x\text{Y}_{1-x}\text{Cl}_6$ , Optimizing Performance for All-Solid-State Batteries	MDPI (Chemengineering)	2026-06-18	Switzerland	Solid-State Batteries
S1-06	PatSnap Analysis Reveals Safety and Cost Challenges for Solid-State and Anode-Free Batteries in EVs	PatSnap Eureka	2026-06-16	International	Solid-State Batteries
S1-07	Anker SOLIX Analysis: Solid-State Batteries Offer Theoretical High Density, Superior Safety, Yet Face Cost and Scalability Hurdles vs. Li-ion	Anker SOLIX	2026-06-12	China	Solid-State Batteries
S1-08	RSC Paper Reports Highly Functional Solid-State Electrolyte Integrating Li-IL into MOF/Polymer Materials, Achieving 200 Hours of Stable Cycling	RSC Publishing	2026-06-18	UK	Solid-State Batteries
S1-09	Solidion Technology Unveils AI-Assisted BEEP Bipolar Solid-State Battery for Aerospace and EV, Promising Lighter, Smaller, Lower-Cost Systems	PR Newswire	2026-06-16	US	Solid-State Batteries
S1-10	Atlantic Council Calls for US-South Korea Alliance on Solid-State and Li-Sulfur Batteries to Counter China's Dominance	Atlantic Council	2026-06-11	US	Solid-State Batteries
S1-11	Critical Resources Achieves Solid-State Battery Manufacturing Milestone with Solvent-Free DSD Technology, Developing Non-Sulfide Electrolytes with Competitive Ionic Conductivity	Yahoo Finance (ICYMI)	2026-06-19	Australia	Solid-State Batteries
S1-12	ACS Paper Proposes Rational Electrolyte Additive Design for Low-Temperature Lithium Metal Batteries to Boost Durability and Safety	ACS Publications (Nano Letters)	2026-06-12	US	Solid-State Batteries

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S1-13	Factorial Energy Secures \$200M in Series D to Accelerate Solid-State Battery Commercialization for EVs	TechCrunch	2026-06-17	US	Solid-State Batteries
S1-14	Toyota Unveils 2028 Target for EV Integration of Next-Gen Solid-State Batteries, Details Production Roadmap	Reuters	2026-06-15	Japan	Solid-State Batteries
S1-15	Solid Power Partners with BMW to Co-Develop and Test Advanced Solid-State Battery Cells for Future EVs	Business Wire	2026-06-18	US	Solid-State Batteries
S1-16	ProLogium Confirms European Gigafactory Plan, Secures Additional EU Investment for Solid-State Battery Production by 2029	Electrek	2026-06-16	Taiwan	Solid-State Batteries
S1-17	CATL Commits Significant Investment to Solid-State Battery R&D; and Production Capacity in China	South China Morning Post	2026-06-14	China	Solid-State Batteries
S1-18	SES AI Reports Promising A-Sample Results for Hybrid Lithium-Metal Batteries with Automotive OEM Partners, Paving Way for B-Sample Deliveries	Globe Newswire	2026-06-17	US	Solid-State Batteries
S1-19	WeLion Unveils New High-Safety, High-Energy-Density Semi-Solid-State Battery for Commercial EVs, Targeting Urban Delivery Fleets	InsideEVs	2026-06-13	China	Solid-State Batteries
S1-20	Japan's NEDO Launches Multi-Billion Yen Project to Accelerate All-Solid-State Battery Material Development	Nikkei Asia	2026-06-19	Japan	Solid-State Batteries
S1-21	Volkswagen Boosts Investment in QuantumScape, Eyes Earlier Production Timeline for Anode-Free Solid-State Batteries in EVs	Electrek	2026-06-12	US	Solid-State Batteries
S1-22	StoreDot's Solid-State Battery Breakthrough: Ultra-Fast Charging Poised to Halve EV Charge Times, Enhance Safety	Green Car Reports	2026-06-11	Israel	Solid-State Batteries
S1-23	Murata Manufacturing to Significantly Expand Solid-State Battery Production for Wearables and IoT Devices	Japan Times	2026-06-16	Japan	Solid-State Batteries
S1-24	Gotion High-Tech Announces Breakthrough in Solid-State Electrolyte Material, Boosting Ionic Conductivity and Stability for EV Batteries	Gasgoo	2026-06-15	China	Solid-State Batteries
S1-25	Albemarle Invests in New Lithium Extraction Technology to Support Growing Global Battery Demand, Crucial for Solid-State Future	Mining.com	2026-06-14	US	Solid-State Batteries

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S1-26	Umicore Unveils Next-Gen Cathode Materials for High-Performance Solid-State EV Batteries	Auto News Europe	2026-06-17	Belgium	Solid-State Batteries
S1-27	Factorial Energy to Establish Solid-State Battery Pilot Production Line in US with DOE Support, Boosting Domestic Manufacturing	Department of Energy Press Release	2026-06-18	US	Solid-State Batteries
S1-28	Solid Power Actively Explores Licensing Agreements for its Solid Electrolyte Technology to Accelerate Commercialization	Investor Relations Update	2026-06-15	US	Solid-State Batteries
S1-29	Samsung SDI Unveils Advanced All-Solid-State Battery Prototypes at InterBattery Europe 2026, Reaffirming Near-Term Commercialization	ETNews	2026-06-12	South Korea	Solid-State Batteries
S1-30	China's BYD Establishes New Research Center to Accelerate Solid-State Battery Development for Next-Gen EVs	Caixin Global	2026-06-13	China	Solid-State Batteries
S1-31	EBA Drives Solid-State Battery Safety Standards to Unlock Widespread Adoption and Trust	EU Commission Press Release	2026-06-17	Europe	Solid-State Batteries
S1-32	ULVAC Unveils Next-Generation Thin-Film Deposition Equipment for Mass Production of Solid Electrolytes, Addressing Key Solid-State Battery Bottlenecks	Semiconductor Engineering	2026-06-11	Japan	Solid-State Batteries
S1-33	Kureha Expands PVDF Binder Material Production Capacity for Next-Gen Batteries, Including All-Solid-State	Chemical Week	2026-06-14	Japan	Solid-State Batteries
S1-34	Mitsui Chemicals Develops Novel Polymer Composite Electrolyte for Semi-Solid-State Batteries, Balancing High Ionic Conductivity and Mechanical Stability	Nikkan Kogyo Shimbun	2026-06-16	Japan	Solid-State Batteries
S1-35	Targray Inks Supply Agreement for High-Purity Lithium Metal Foil to Accelerate Solid-State Battery R&D; and Prototyping	PR Newswire	2026-06-18	Canada	Solid-State Batteries
S1-36	Blue Solutions Reports Steady Progress in Solid-State Battery Rollout for Electric Buses, Demonstrating Robust Performance and Safety in Commercial Fleets	Transport Topics	2026-06-15	France	Solid-State Batteries
S1-37	Honda Reportedly Explores Joint Venture for Solid-State Battery Manufacturing in North America, Localizing EV Supply Chain	Automotive News	2026-06-17	Japan	Solid-State Batteries
S1-38	US DOE Awards Significant Grant to University Consortium for Advanced Solid-State Battery Research, Targeting Next-Gen Materials and Cell Structures	EurekAlert!	2026-06-14	US	Solid-State Batteries

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S2-01	Oxford PV and Fraunhofer ISE Unveil 25.6% Efficient Perovskite-Silicon Tandem Module with Matrix Shingle Technology	PV Tech	2026-06-18	Germany	Perovskite Solar Cells
S2-02	JinkoSolar Achieves 34.82% World Record Efficiency for N-Type TOPCon Perovskite Tandem Solar Cell	SolarQuarter	2026-06-19	China	Perovskite Solar Cells
S2-03	GCL Perovskite to Begin Mass Shipment of Commercial Modules by Q3 2026 from 500 MW Line, Achieves 27% Efficiency on Large-Area Tandem	TaiyangNews (YouTube)	2026-06-16	China	Perovskite Solar Cells
S2-04	Perovskite-Silicon Tandem Commercialization Key to N-Type Solar Module Market Growth; LONGi Initiates Pilot Production	SolarQuarter	2026-06-19	International	Perovskite Solar Cells
S2-05	IPVF and TU Delft Achieve 31% Efficiency for 4cm <sup>2</sup> Perovskite-Silicon Tandem Cell Using Industrial-Compatible Process	pv magazine Global	2026-06-18	France / Netherlands	Perovskite Solar Cells
S2-06	Cornell Study Projects Perovskite Tandem PV in Agrivoltaics Could Offset 30.9 Million Tons CO <sub>2</sub> and Save 8.4 Billion m <sup>3</sup> Water Annually	pv magazine Global	2026-06-17	US	Perovskite Solar Cells
S2-07	UtmoLight Unveils New Perovskite Solar Module Series at SNEC 2026, Including 2.81m <sup>2</sup> , 500W Weather-Resistant "Chuangshi S2"	pv magazine Global	2026-06-16	China	Perovskite Solar Cells
S2-08	Trinasolar Sets World Record with 907W Output and 29.2% Aperture Area Efficiency for 210mm Perovskite/C-Si Tandem Module	Renewable Energy Magazine	2026-06-18	China	Perovskite Solar Cells
S2-09	Sungkyunkwan Professor Park Advocates for South Korea to Focus on Single-Junction Perovskite Cell Advances Amid Rising AI, Space Demand	Maeil Business News Korea (Mk.co.kr)	2026-06-16	South Korea	Perovskite Solar Cells
S2-10	Perovskite Solar Cells in 2026: Stability, Lead Management, and Manufacturing Scale-Up Poised to Surpass Silicon Limits	TaiyangNews (YouTube)	2026-06-17	International	Perovskite Solar Cells
S2-11	Perovskite-Silicon Tandem Solar Cells Exceed 30% Efficiency, LONGi Publishes 31.25% Breakthrough in Nature	SolarQuarter	2026-06-11	International	Perovskite Solar Cells
S2-12	Chinese Solar Giants to Launch "Computing Satellite" with GCL's 30.2% Efficient Perovskite-Silicon Tandem Modules This Year	Yicai Global	2026-06-11	China	Perovskite Solar Cells
S2-13	Perovskite-Silicon Tandem Technology Redefines Solar PV "Value Proposition" from \$/W to Area Efficiency & Bankability	□□ (Charlie)	2026-06-11	South Korea	Perovskite Solar Cells

ID	Title	Source	Date	Region	Sub-Topic
S2-14	GCL Perovskite Announces 500MW Production Line Operation and Commercial Module Shipment by Q3 2026 at SNEC 2026, Targeting Space Applications with 4T Tandem	TaiyangNews (YouTube)	2026-06-16	China	Perovskite Solar Cells
S2-15	Trinasolar Achieves World-Record 29.2% Efficiency for Perovskite-Silicon Tandem Solar Module; Tandem PV Initiates Mass Production in US	CleanTechnica	2026-06-14	US	Perovskite Solar Cells
S2-16	Perovskite Solar Cells' "High Efficiency, Reliability, and Bankability" Become Key to Commercialization as SpaceX IPO Nears	□□□□e (Sisajournal-e)	2026-06-11	South Korea	Perovskite Solar Cells
S2-17	Oxford PV and Fraunhofer ISE Achieve 25.6% Efficiency for Perovskite-Silicon Tandem Module with Shingled Design	pv magazine Global	2026-06-18	Germany	Perovskite Solar Cells
S2-18	South Korea and China Intensify Perovskite Mass Production Race for Space Solar Market: Hanwha Solutions Joins Lunar Probe, China Establishes Space Energy Alliance	□□□□□□ (Unicorn Factory)	2026-06-17	South Korea	Perovskite Solar Cells
S3-01	Dachser to Be First Customer for Mercedes-Benz NextGenH2 Hydrogen Fuel Cell Trucks in Europe by December 2026	TT - Transport Topics	2026-06-15	Germany	Hydrogen Energy
S3-02	China Activates Largest Integrated Solar-Hydrogen-Storage Project in Jiangsu, Targeting 482 Ton/Year Green Hydrogen Output	SolarQuarter	2026-06-15	China	Hydrogen Energy
S3-03	South Korea to Bid for 500 GWh/Year Clean Hydrogen Power and 930 GWh/Year General Hydrogen Power in H2 2026	S&P; Global Energy	2026-06-16	South Korea	Hydrogen Energy
S3-04	Plug Power Sells \$39.2M Federal Investment Tax Credits for St. Gabriel Hydrogen Liquefaction Facility, Boosting Liquidity Amid Insider Sales Concerns	Simply Wall St	2026-06-15	US	Hydrogen Energy
S3-05	ITM Power CEO and CTO Acquire 226 Shares Each at £1.3305 Through Buy-as-You-Earn Plan, Signaling Executive Confidence	TipRanks.com	2026-06-17	UK	Hydrogen Energy
S3-06	Plug Power Grants Director Andrew Marsh 250,898 New Stock Options with Strike Prices of \$1.81 and \$2.26, Exercisable Until 2036	Stock Titan	2026-06-16	US	Hydrogen Energy
S3-07	Plug Power's Electrolyzer Business Surges 345%, Driving Q1 2026 Revenue to \$163.5M with 22% YOY Growth	Zacks Investment Research	2026-06-16	US	Hydrogen Energy
S3-08	India's National Green Hydrogen Mission Secures 670,000 MTPA Green Ammonia Supply for 11 Fertilizer Plants, Bolstering Startup Support	Deccan Herald	2026-06-17	India	Hydrogen Energy

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S3-09	Hydrogen Energy Transition Requires Robust Storage and Infrastructure to Link Production and Consumption	AZoCleantech	2026-06-18	UK	Hydrogen Energy
S3-10	Japan Launches World's First Commercial Large Gas Engine Capable of Generating Power with up to 30% Hydrogen-Natural Gas Mix, Developed by Kawasaki Heavy Industries	The Economic Times	2026-06-18	Japan	Hydrogen Energy
S3-11	NEOM's Gigascale Green Hydrogen Plant Nears Completion, Targeting 600 Tons/Day Output by 2027	Autonocion.com	2026-06-18	Saudi Arabia	Hydrogen Energy
S3-12	HTEC Inaugurates Canada's First 700 Bar Commercial Heavy-Duty Clean Hydrogen Station in Tsawwassen, BC	GlobeNewswire	2026-06-18	Canada	Hydrogen Energy
S3-13	Electrolyzer Innovator Power to Hydrogen (P2H2) Named WEF Technology Pioneer 2026, Aims for 65% Green Hydrogen Cost Reduction with AEM Technology	H2 International	2026-06-17	US	Hydrogen Energy
S3-14	Ohmium International Honored with Frost & Sullivan's 2026 Technology Innovation Leadership Award for High-Efficiency Modular PEM Electrolyzers and 2-4GW Gigafactory	City AM	2026-06-18	US	Hydrogen Energy
S3-15	Plug Power Shares Rise 7% on Improved Liquidity Outlook from Inflation Reduction Act (IRA) Tax Credit Sale	Kalkine	2026-06-19	US	Hydrogen Energy
S3-16	India Emphasizes Renewable Energy, Green Hydrogen, and Innovation as Critical for Achieving 'Viksit Bharat 2047' Vision	eGov Magazine	2026-06-19	India	Hydrogen Energy
S3-17	Power to Hydrogen (P2H2) Reports Superior Performance from Hybrid Electrolyzers, Blending PEM Efficiency with AEM Economics for Reliable Hydrogen Generation	AZoCleantech	2026-06-19	US	Hydrogen Energy
S3-18	South Korea's Ulsan City Invests 9 Billion Won to Select and Nurture 11 'Hydrogen Champion' Firms, Strengthening Regional Hydrogen Ecosystem	Seoul Economic Daily	2026-06-16	South Korea	Hydrogen Energy
S3-19	India's National Green Hydrogen Mission Identifies Safe, Economical Large-Scale Hydrogen Storage as Critical Infrastructure Challenge	Renewable Watch	2026-06-19	India	Hydrogen Energy
S3-20	IEA: Global Hydrogen Demand Exceeds 100 Million Tons in 2025, Hindered by High Costs and Infrastructure Gaps for 2030 Decarbonization Targets	IEA	2026-06-18	France	Hydrogen Energy
S3-21	ITM Power Stock Plunges 30% in Two Weeks Post-MSCI Inclusion & Sell Rating, But Long-Term Growth Potential Remains	Yahoo Finance UK	2026-06-13	UK	Hydrogen Energy

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S3-22	Israel Accelerates Hydrogen Economy with \$3.4M Tender for Refueling Stations and Fuel Cell Trucks	The Jerusalem Post	2026-06-17	Israel	Hydrogen Energy
S3-23	ORLEN Unveils Gdynia's Seventh Hydrogen Station, Advancing Poland's Decarbonized Transport Network	Hydrogen Central	2026-06-19	Poland	Hydrogen Energy
S3-24	Europe's North Adriatic Hydrogen Valley Launches with 200km Cross-Border Pipeline Network	Pipeline & Gas Journal	2026-06-18	EU ( , )	Hydrogen Energy
S3-25	Plug Power Exceeds Q1 Revenue Forecast at \$163.51M, Targets Full Profitability by End of 2028	Zacks.com	2026-06-18	US	Hydrogen Energy
S3-26	Fuel Cell Energy's Commercial Sales Pipeline Surges 267% to 4 GW, Driven by Data Center Demand	EnkiAI	2026-06-17	US	Hydrogen Energy
S3-27	Bloom Energy Stock Soars 219% YTD, Secures \$5B Brookfield Partnership for AI Data Centers and 900 MW AEP Option	TradingView	2026-06-17	US	Hydrogen Energy
S3-28	Wood Mackenzie: Refineries Drive Two-Thirds of Post-FID Green Hydrogen Capacity in Europe, Signaling Sector's Shift to Action Phase	Wood Mackenzie	2026-06-16	UK	Hydrogen Energy
S3-29	Global Green Hydrogen Production and Infrastructure Market Projected to Reach \$46.8 Billion by 2034 with 22.9% CAGR	IndexBox (via Market Research Future)	2026-06-15	US	Hydrogen Energy
S3-30	Electrolyzer Anode Materials Market to Grow Through 2035 Driven by PEM Capacity Surge and Iridium Supply Constraints	IndexBox	2026-06-19	US	Hydrogen Energy
S3-31	Luxembourg Hydrogen Valley Project Reaches FID for 5MW Electrolyzer, Ohmium and Hynfra Partner on Green Hydrogen in MEA Region	PV Magazine	2026-06-19	Germany	Hydrogen Energy
S3-32	GE Vernova and IHI Advance F-Class Ammonia Combustion, Achieve 100% Hydrogen Firing for B/E-Class Gas Turbines	GE Vernova	2026-06-17	US	Hydrogen Energy
S3-33	HydrogenCalc Data Reveals Strong Early-Stage Momentum in Global Hydrogen Project Pipeline with Active Status Updates	HydrogenCalc	2026-06-19	UK	Hydrogen Energy
S3-34	MOL and NYK Secure 4 VLGCs via Long-Term Charter with JERA for U.S.-Japan Low-Carbon Ammonia Transport	Splash247	2026-06-18	Japan	Hydrogen Energy
S3-35	Amogy and Kowa Partner to Deploy Ammonia Cracking-Based Hydrogen Supply Solutions in Japan	PR Newswire	2026-06-17	Japan	Hydrogen Energy

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S3-36	Electrolyzer Durability Emerges as Hydrogen Industry's Primary Challenge, Shifting Focus from Efficiency for Major Manufacturers	The Voice of Renewables	2026-06-18	UK	Hydrogen Energy
S3-37	Liquid Organic Hydrogen Carrier (LOHC) Market Expected to Reach \$530 Million by 2026, Driven by Decarbonization and Green Hydrogen Adoption	Note (via Market Research)	2026-06-17	International	Hydrogen Energy
S3-38	DACHSER Becomes First Customer for Daimler Truck's Next-Gen Liquid Hydrogen Fuel Cell Truck, Achieving 1,000km+ Range	Daimler Truck	2026-06-15	Germany	Hydrogen Energy
S3-39	Hydrogen-Powered eVTOL Market Growth Driven by Aviation Decarbonization and Asia-Pacific Hydrogen Initiatives	Valuates Reports (via openPR.com)	2026-06-18	International	Hydrogen Energy
S3-40	Chiyoda Corp. Leads Consortium to Pilot Next-Gen Remote O&M; for Regional Plants Using NTT's APN-IOWN, Addressing Labor Shortages	CHIYODA CORPORATION	2026-06-12	Japan	Hydrogen Energy
S3-41	Nederlandse Gasunie to Invest €10 Billion by 2030, Allocating 40% to Hydrogen Network and 30% to CCS/Heat Infrastructure	S&P; Global Ratings	2026-06-19	Netherlands	Hydrogen Energy
S3-42	S&P; Global Reports South Korea Adjusts Clean Hydrogen Power Strategy to Market Realities, Early Projects Unlikely to Meet 2030 Emission Targets	S&P; Global	2026-06-19	South Korea	Hydrogen Energy
S3-43	POSCO Completes South Korea's Largest Electric Arc Furnace at Gwangyang, Achieving 75% Carbon Reduction and 2.5 Million Ton Annual Capacity	GMK Center	2026-06-19	South Korea	Hydrogen Energy
S3-44	Lhyfe and STRABAG Form Strategic Partnership to Accelerate Green Hydrogen Development in Germany	Hydrogen Europe	2026-06-19	Germany	Hydrogen Energy
S3-45	Saudi Arabia's NEOM Green Hydrogen Plant Nears Completion, Targeting 600 Tons/Day Production by 2027	Autonocion.com	2026-06-18	Saudi Arabia	Hydrogen Energy
S3-46	"Hydrogen Era" Dawns as AI Data Center Power Demands Surge; Ballard Power Systems Secures Major European Fuel Cell Contracts	TradingKey	2026-06-19	US	Hydrogen Energy
S4-01	Google-Backed Energy Dome and SRP Deploy Landmark CO2 Battery for Arizona Grid Resilience	Utility Dive	2026-06-16	US	Next-Gen Storage
S4-02	Europe and G7 Elevate Battery Recycling to Strategic Resource: Targeting 25% Recycled Content by 2030 for Supply Chain Resilience	MiningSEE	2026-06-14	Europe	Next-Gen Storage

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S4-03	American Battery Leadership Coalition Launches to Drive Sodium-Ion Battery Adoption as a U.S. National Priority	IndexBox	2026-06-18	US	Next-Gen Storage
S4-04	CALB Secures Approval for 110GWh Energy Storage Project in China; Nayuan Technology Breaks Ground on 10GWh Sodium-Ion Battery Plant in Ningxia	Energytrend	2026-06-18	China	Next-Gen Storage
S4-05	Chery-Partnered Sodium-Ion Battery Plant Commences Production in China, Highlighting Hard Carbon as Key Technology	SodiumBatteryHub	2026-06-16	China	Next-Gen Storage
S4-06	Moonwatt Pioneers Sodium-Ion BESS in Pakistan to Stabilize Renewable Energy Grids	IWAP OPTOELECTRONICS	Date unknown	Pakistan	Next-Gen Storage
S4-07	Inlyte Energy Develops Iron-Sodium Modules for Low-Cost, Long-Life Grid Storage Using Iron Powder and Table Salt	Crossworldtours.co.za	Date unknown	Global	Next-Gen Storage
S4-08	Multi-Level Testing Framework Pivotal for Improving Sodium-Ion Battery Manufacturing Yields Amidst Commercial Scale-Up	iESTbattery	2026-06-16	Global	Next-Gen Storage
S4-09	Sodium-Ion Battery Commercialization Accelerates: Natron Energy Commences Mass Production, UNIGRID Raises \$12M, and EcoPro BM in Cathode Production Talks	SodiumBatteryHub	2026-06-18	Global	Next-Gen Storage
S4-10	NAN GreenMet of India Partners with Belgium's Silox to Build Large-Scale Li-Ion Battery Recycling Plant, Targeting 40,000 Tonnes Annually	Whalesbook	2026-06-18	India	Next-Gen Storage
S4-11	ABTC Develops Novel Battery Recycling Technology Boosting Lithium Recovery Rates via Direct Extraction from Black Mass	Critical Materials Bulletin	2026-06-13	US	Next-Gen Storage
S4-12	Ascend Elements' Kentucky Battery Recycling Plant Sells for \$31.7M to Turner-Kokosing JV in Chapter 11 Auction	Industrial Info	2026-06-16	US	Next-Gen Storage
S4-13	India's EV Battery Recycling Sector Emerges, Learning from Sweden's Global Leadership to Build Circular Supply Chains	EVELECTREE	2026-06-16	India	Next-Gen Storage
S4-14	Key Considerations for Establishing a Battery Recycling Plant: Emphasizing Efficient Recovery and Environmental Compliance	Machinery Recycle	2026-06-16	Global	Next-Gen Storage
S4-15	UK Bolsters BESS Fire Safety Guidelines: New Requirements for Commercial and Industrial Operators	Electrical Review	2026-06-17	UK	Next-Gen Storage
S4-16	NYSERDA Updates BESS Fire Safety Regulations, Emphasizing 'Defensive Stance' for Firefighters	Sun Community News	2026-06-17	US	Next-Gen Storage

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S4-17	Aquaspira Delivers Innovative Firewater Containment for BESS, Adopted by UK's 400MW Hams Hall Facility	Aquaspira	2026-06-17	UK	Next-Gen Storage
S4-18	Revised 2026 Guide Details Multi-Layered DC Protection and Global Compliance for 1500V BESS	Kuangya	2026-06-16	Global	Next-Gen Storage
S4-19	Wärtsilä & RCT Solutions Forge Global Energy Storage Venture, Targeting Profitability by Late 2027 Amid Market Dynamics	Wärtsilä Corporation	2026-06-15	Finland	Next-Gen Storage
S4-20	Novel Carbon Anode Boosts Sodium-Ion Battery Cycle Life Beyond 500 Cycles	Journal of Energy Storage	2026-06-15	Netherlands	Next-Gen Storage
S4-21	CATL Unveils Next-Gen Sodium-Ion Battery Platform: 20-Year Lifespan, 600km EV Range, and Cold-Weather Performance	Bitcoin News	2026-06-17	China	Next-Gen Storage
S4-22	American Battery Leadership Coalition Launches to Designate Sodium-Ion Batteries as U.S. National Priority, Building Domestic Supply Chain	Business Wire	2026-06-16	US	Next-Gen Storage
S4-23	Imperial College London Wins Award for Solvent-Free Dry Electrode Manufacturing, Poised to Slash Battery Costs and Environmental Impact	Imperial News	2026-06-18	UK	Next-Gen Storage
S4-24	Silicon Anodes Set to Disrupt EV Battery Market Ahead of Solid-State: Amprius and Sila Nanotechnologies Boost Range and Charging Speed	InsideEVs	2026-06-19	US	Next-Gen Storage
S4-25	Dragonfly Energy Secures European Patent for Dry Electrode Manufacturing and Solid-State Battery Technology, Strengthening IP Portfolio	GlobeNewswire	2026-06-15	US	Next-Gen Storage
S4-26	Wildcat Discovery Technologies and EnergyX Announce \$230M Joint Venture for 15,000-Ton LFP Cathode Manufacturing Facility in Texas, Bolstering U.S. Supply Chain	Batteries News	2026-06-18	US	Next-Gen Storage
S4-27	Peak Energy and GM Partner on Grid-Scale Sodium-Ion Batteries: Targeting 20% Cost Reduction and Expanding Domestic Supply	Utility Dive	2026-06-16	US	Next-Gen Storage
S4-28	Massachusetts and Minnesota Accelerate VPP Programs to Address Data Center and EV Demand, Targeting 3.5 GW by 2035	MarketScale	2026-06-18	US	Next-Gen Storage
S4-29	Sila Nanotechnologies Files Patent Infringement Lawsuits Against China's C-ONE to Protect U.S. Battery Innovation and Domestic Production	Business Wire	2026-06-18	US	Next-Gen Storage

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S4-30	Enovix (ENVX) Potentially 46% Undervalued After Muted Response to New Orders: Analysts Project Strong Growth from 2025 High-Volume Production and Next-Gen Batteries	Simply Wall St	2026-06-16	US	Next-Gen Storage
S4-31	CATL and BYD Accelerate Na-Ion Battery EV Development, Enhancing Competitiveness in Cost, Safety, and Low-Temperature Performance	Energy Research & Social Science	2026-06-18	Netherlands	Next-Gen Storage
S4-32	LICAP Technologies Secures \$11.3 Million California Grant to Scale Next-Gen Battery Dry Electrode Manufacturing for Sustainable Energy	Batteries News	2026-06-18	US	Next-Gen Storage
S4-33	BriefGlance Forecasts Virtual Power Plant (VPP) Market to Reach 55-70 GW with \$3.5-5.5 Billion Annual Revenue by 2026: A Promising Alternative to Natural Gas Peaker Plants	BriefGlance	2026-06-18	US	Next-Gen Storage
S4-34	Silicon Anode Batteries Set to Dominate EV Market Ahead of Solid-State: Group14 Technology Powers Molicel Batteries in Hypercars	Motorsport Network	2026-06-18	US	Next-Gen Storage
S4-35	General Motors Becomes First Automaker to Partner with Redwood Materials Across Full Battery Lifecycle: Over \$3M Annual Savings from Reused Batteries Powering AI Data Centers	General Motors	2026-06-18	US	Next-Gen Storage
S4-36	California's Ava Community Energy Offers Up to \$6,000 Rebate for Home Battery Installations to Join VPP, Bolstering Grid Reliability	Electrek	2026-06-18	US	Next-Gen Storage
S4-37	LFP Battery Costs to Enter New Phase in 2026: Supply Stability and Partnerships Crucial Alongside Raw Material Prices	BOSA Energy	2026-06-16	China	Next-Gen Storage
S4-38	Chinese OEMs Enter Battery Manufacturing, Accelerating Supply Chain Collaboration for Next-Gen Battery Commercialization	Moomoo News	2026-06-17	China	Next-Gen Storage
S4-39	Telborg Explores Data Centre Energy Strategy: Emphasizing Resilience and Sustainability	Telborg	Date unknown	Global	Next-Gen Storage
S4-40	G7's Critical Minerals '60% Rule' Reshapes Supply Chains, Accelerating Diversification from Chinese Dependence	Skilling's Mining Review	2026-06-16	Global	Next-Gen Storage
S4-41	Sila Nanotechnologies Files US ITC and District Court Actions to Protect Domestic Battery Innovation	BusinessWire	2026-06-18	US	Next-Gen Storage

ID	Title	Source	Date	Region	Sub-Topic
S4-42	Novel Polymer Electrolyte Suppresses Polysulfide Shuttle, Dramatically Extending Li-Sulfur Battery Cycle Life	Nature Energy	2026-06-14	UK	Next-Gen Storage
S4-43	Waymo and B2U Storage Solutions Partner to Repurpose Used EV Batteries for Stationary Storage	Waymo Blog	2026-06-18	US	Next-Gen Storage
S4-44	The Rise of Virtual Power Plants (VPP): Stabilizing Grids with Distributed Energy Resources	Energy Solutions	2026-06-18	Global	Next-Gen Storage
S4-45	GM to Adopt Silicon Anodes and Solid-State Batteries for EVs, Dramatically Boosting Range and Charging Speed	InsideEVs	2026-06-18	US	Next-Gen Storage
S4-46	California VPP Rolls Out \$6,000 Rebate for New Home Batteries to Strengthen Grid	Electrek	2026-06-18	US	Next-Gen Storage
S4-47	Silicon Anodes Paving Way for Fast-Charging EVs: Sila Nanotechnologies & Amprius Lead Commercialization with Volume Expansion Control	Advanced Energy Materials	2026-06-16	Germany	Next-Gen Storage
S4-48	Solvent-Free Dry Electrode Manufacturing Slashes Battery Production Energy & Environmental Footprint	ACS Applied Materials & Interfaces	2026-06-17	US	Next-Gen Storage
S4-49	Vanadium Redox Flow Batteries Prove High Reliability and Longevity in Grid-Scale Energy Storage Deployments	IEEE Transactions on Energy Conversion	2026-06-19	US	Next-Gen Storage
S4-50	Enhanced Fire Safety for Large-Scale BESS: Emphasizing Early Thermal Runaway Detection, Suppression, and System Design	Journal of Power Sources	2026-06-13	Netherlands	Next-Gen Storage
S4-51	Environmentally Friendly Direct Lithium Recovery from Spent EV Batteries Achieves High Yields and Reduced Environmental Impact	Green Chemistry	2026-06-17	UK	Next-Gen Storage
S4-52	US IRA Accelerates Global Battery Material Supply Chain Reshaping: North America & Europe Prioritize Critical Mineral Security to Reduce China Dependence	Energy Policy	2026-06-19	Netherlands	Next-Gen Storage
S4-53	Battery Storage-Integrated VPPs Crucial for Renewable Energy Balancing and Grid Stabilization	Applied Energy	2026-06-15	Netherlands	Next-Gen Storage
S4-54	Second-Life EV Batteries Paving Way for New Business Models in Residential and Commercial Storage	Journal of Energy Storage Research	2026-06-18	International	Next-Gen Storage
S4-55	Review Reveals Next-Generation Cathode Materials Beyond LFP/LMFP for High-Energy Density Batteries Exceeding Li-Ion Limits	Advanced Materials	2026-06-16	Germany	Next-Gen Storage

ID	Title	Source	Date	Region	Sub-Topic
S4-56	Anode-Free Lithium Metal Batteries Advance Towards Maximum Energy Density, Facing Dendrite Formation and Cycle Life Challenges	Nano Energy	2026-06-12	Netherlands	Next-Gen Storage
S4-57	LDES Technologies Emerge for Grid Decarbonization: Form Energy's Iron-Air and Energy Dome's CO2 Batteries Highlighted for Economics and Scalability	Joule	2026-06-20	US	Next-Gen Storage
S4-58	EU Battery Regulation Reshapes Global Battery Supply Chain: Sustainability and Traceability Mandates Drive Transformative Change	Resources, Conservation & Recycling	2026-06-14	Netherlands	Next-Gen Storage
S4-59	Sodium-Ion Battery Costs Projected to Drop to \$40-55/kWh by 2028, Approaching LFP Energy Density for Stationary Storage	JM Batteries	2026-06-12	Global	Next-Gen Storage
S4-60	SolaX Power Identifies LFP Batteries and CATL's 9MWh TENER Stack as 2026 Global BESS Market Leaders	SolaX Power	2026-06-12	China	Next-Gen Storage
S4-61	Sodium-Ion Battery Materials Market to Reach \$501.18 Million by 2034, Driven by Chinese Expansion	Fortune Business Insights	2026-06-18	Global	Next-Gen Storage
S4-62	Form Energy's Iron-Air Battery Enables Multi-Day Power Storage, Begins Production at West Virginia Plant	Industry Insights by Battery Materials Review	2026-06-15	US	Next-Gen Storage
S4-63	GM and Peak Energy Partner to Cut Stationary Storage Costs by 20% with Sodium-Ion Batteries	Utility Dive	2026-06-16	US	Next-Gen Storage

## Editor's Note

### Navigating the Energy Transition: Western Imperatives

The current week's developments underscore a critical inflection point in the global energy transition. While Asian players, particularly China, are rapidly scaling next-generation technologies like perovskite solar cells (34.82% efficiency record) and sodium-ion batteries (\$40-55/kWh by 2028), Western nations are strategically responding with policy-driven initiatives (US IRA, EU Critical Raw Materials Act) aimed at securing domestic supply chains and fostering innovation. This dual-track approach highlights both the urgency and the competitive nature of decarbonization efforts.

For Western manufacturers, investors, and executives, the imperative is clear: proactive engagement in R&D, strategic partnerships, and robust supply chain diversification are non-negotiable. The rise of AI-driven energy demand (4 GW fuel cell pipeline) and the shift towards electrolyzer durability in hydrogen production signal evolving market needs. Investing in advanced materials, dry electrode manufacturing, and comprehensive safety standards will be key differentiators in a market increasingly valuing resilience and sustainability alongside performance.

The commercialization timelines for solid-state batteries (Toyota 2028 target) and the rapid deployment of VPPs (55-70 GW by 2026) demonstrate that theoretical breakthroughs are quickly translating into market

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realities. Western players must leverage their strengths in high-value engineering, regulatory leadership, and collaborative ecosystems to establish competitive positions, ensuring that the energy transition is not only green but also secure and economically beneficial for their regions.

- ◆ How can Western OEMs accelerate solid-state battery integration by 2028 without becoming reliant on Asian supply chains?
- ◆ What specific investments in electrolyzer durability and hydrogen infrastructure are required by Q4 2026 to meet 2030 decarbonization targets?
- ◆ What strategic partnerships should Western material suppliers form to capitalize on the \$40-55/kWh sodium-ion battery market by 2028?

Troy Technical Weekly Editorial Team Editorial Assistant

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