CATL (300750.SZ): ESS Open-Day Takeaways: Deepening Moat in the System-Integration Transition

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We attended two ESS-focused open-day events hosted by CATL during September 20-21 as part of the company's Global Quality Month: a panel discussion with CTOs from CATL's ESS business and selected customers in Ningde, followed by a visit to the Xiamen Energy Storage Validation Research Institute (ESVL). Key takeaways from the events reinforced our differentiated thesis that CATL's transition from battery supplier to integrated BESS solution provider remains underappreciated (see our initiation). In our view, CATL is deepening its system-level moat through an ecosystem approach that combines cell quality, system integration, field-data analytics, grid know-how and validation infrastructure—supporting margin resilience, earnings quality, market share gains and valuation upside over the long-term. Reiterate Buy.

We summarize below our top five takeaways from the two events.

1. **CATL's moat is shifting from cell quality to full-stack system intelligence.** Best-in-class cell reliability remains the foundation, but the bigger differentiation is CATL's ability to integrate chemistry, thermal management, BMS/EMS algorithms, grid simulation and field data into one optimized BESS platform.
2. **Quality is an IRR lever, not a cost item.** Capex premium explains only a small part of project economics, while higher availability, slower degradation, wider usable DoD and on-time commissioning can compound into meaningfully better lifecycle returns.
3. **CATL expects ESS momentum to remain strong into 2027E.** The company guides for 40-50% global ESS battery demand growth and expects another year of solid growth in China.
4. **Sodium-ion is becoming a credible long-duration ESS chemistry.** CATL positions sodium not just as a lithium supplement, but as a lifecycle-driven solution with cost, safety, temperature-tolerance and resource-security advantages, especially for long-tenor projects.
5. **ESVL can help turn BESS from a black box into a verifiable asset.** The Xiamen facility highlights CATL's push from component testing to full-system, station-level validation, making safety, reliability and 20-year asset performance more transparent before commercial deployment.



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Day 1: Panel discussion

Panelists:

- *Mr. WU Dianfeng, CTO of zero-carbon division, CATL*
- *Mr. LIN Jiubiao, CTO of domestic ESS division, CATL*
- *Mr. REN Feng, CEO, Shenzhen Huagong Energy Technology*
- *Mr. WANG Kun, Chairman, Jiangsu Guosheng Chuangrong New Energy and Nanjing Sixiang New Energy*

Key messages from the panel discussion are summarized below.

System integration is more than assembly

- **CATL believes one of the biggest misconceptions in ESS is that system integration simply means assembling components from different vendors.** In its view, even high-quality certified components do not automatically translate into stable system-level performance, as compatibility across cells, PCS, thermal management, BMS/EMS and grid interaction is often underappreciated.
- **CATL compared deep ESS integration with leading integrated products in other industries,** including Apple's iPhone, Tesla's Model 3 and NVIDIA's GB300. The company believes its Tener system follows a similar logic by combining hardware, software and control algorithms into one optimized platform.

CATL's moat: from cells to full-stack system intelligence

- **CATL's competitive moat starts with best-in-class battery quality.** A large-scale BESS contains thousands of cabinets and potentially millions of cells. One failed cell can trigger system-level risk through thermal or electrical propagation. CATL's industry-leading PPB-level cell failure rate compresses this risk at the source.
- **High-quality cells are only the starting point.** CATL believes all subsystems ultimately need to maximize battery potential, making deep understanding of battery chemistry critical for system-level design. This is the foundation of **CATL's "Stack on Cell" R&D approach**.
- **Example of CATL's original system design:** once the daily charging and discharging strategy is set, CATL's thermal management system fine-tunes battery status to keep the system at the optimal temperature and availability for each energy-arbitrage trade. Its understanding of battery chemistry also helps define physical operating boundaries and provides timely alerts ahead of thermal runaway risk.
- **CATL also emphasized the importance of data analytics.** The company has 3,000+ BESS projects on hand, tests 10,000+ battery cells annually and has accumulated more than 500bn data entries. These datasets support more optimized algorithms, operating strategies and dispatch decisions.
- CATL believes the ultimate purpose of BESS is to provide grid stability and flexibility efficiently and reliably. As grid interaction becomes increasingly important, **CATL has built a dedicated grid-technology division and simulation teams**, enabling it

to simulate most real-world grid-interaction scenarios before project commissioning.

Quality is an IRR lever, not just a capex item

- **For BESS project IRR, cost matters, but revenue quality matters more.** One customer panelist noted that system capex is largely one-off, while revenue is dynamic, multi-dimensional and realized over a long operating cycle.
- **A typical BESS financial model includes more than 60 variables,** with system capex only one input among many.
  - One customer panelist estimated that **CATL's battery/cabinet price premium versus peers translates into less than 5% system-level capex difference**, typically around 3-4%.
  - By contrast, the panelist highlighted at least eight performance metrics with meaningful impact on project IRR. **A 1ppt outperformance in each metric could compound into an 8ppt system-level uplift**, while a 5ppt outperformance across metrics could translate into a 47ppt uplift—more exponential than linear.
  - This makes **verifiability of critical performance metrics** increasingly important for modeling project IRR accurately and reliably.
- **Examples shared by the two ESS customer panelists** include:
  - One panelist said capacity availability and degradation curve are among the most important drivers of project economics. **The real-world performance gap between tier-1 and other suppliers may be wider than expected** and is only starting to emerge as China's ESS market shifts toward more market-oriented operation. Some C&I projects have already shown worse-than-promised degradation, while **CATL's capacity availability and degradation curve have reportedly outperformed contractual guarantees**. The panelist also noted that CATL's 0-100% DoD range, versus the more common 5-95% range, can provide about 10% more usable capacity per cycle.
  - **Another panelist highlighted CATL's one-stop delivery capability**, citing a large-scale BESS project in Qingdao with a very tight commissioning timeline. CATL helped secure on-time grid connection through pre-commissioning testing, simulation and configuration. The panelist noted that missing a commissioning window could delay revenue recognition by two to three months.



Sodium-ion: credible pathway for long-duration ESS

- **CATL started sodium-ion battery R&D in 2016** and has cumulatively invested c.Rmb10bn in the technology.
- **CATL views sodium not merely as a supplement to lithium,** but as a compelling chemistry for long-lifecycle ESS projects with low maintenance requirements.
- The company highlighted **sodium's cost advantage from lower raw material costs**,

including sodium versus lithium and aluminum foil versus copper foil, as well as its **wide operating temperature range** of -40°C to 60°C and **strong safety profile**.

- **The main drawback is lower energy density**, which CATL aims to mitigate through its Tener stack technology.
- Through customized liquid cooling, high-precision TMS and BMS, CATL said its sodium solution can achieve low auxiliary power consumption, lower station-level failure rates and reduced operating noise.
- In the context of rising energy-independence priorities globally, **sodium also offers a more favorable resource self-sufficiency profile than lithium**.
- CATL also shared **a recent overseas order win for its sodium BESS system**, where sodium was selected over lithium because of its longer lifecycle fit with a 25-year wind-project PPA.

Future ESS technologies: grid-forming, AIDC and system upsizing

- **CATL is optimistic on grid-forming technology**, which can simulate synchronous generators and support integration with existing grid systems. Driven by global electrification, CATL believes grid-forming capability will become a common grid-connection standard, and is developing proprietary algorithms for this application.
- CATL highlighted the sharp difference between AIDC training and inference load profiles. Training loads can fluctuate by 50-100% within milliseconds, which traditional grid design is not well equipped to handle. CATL defines BESS as both a "decoupler" and "energy chamber" between the grid and AIDC, with its AIDC BESS solution focused on multi-timescale load management.
  - On the grid side, CATL uses grid-forming technology to support frequency and voltage stability at the grid-connection point.
  - On the load side, power-type ESS can help smooth AIDC load volatility.
- CATL also acknowledged the **ESS battery upsizing trend**, from 280Ah to 314Ah and now 587Ah, which reduces cell count and cost. However, it sees diminishing marginal benefits from further upsizing given safety, thermal-management and transportation-weight constraints. CATL sees 6-8MW as the system-level sweet spot.

ESS outlook: growth intact despite near-term policy noise

- **CATL remains constructive on global ESS battery demand into 2027E,** expecting 40-50% growth. For China, it expects battery deliveries to rise from 300-350GWh this year to 400-500GWh next year.
- **CATL sees the battery consumption tax mainly affecting timing and pass-through.** Customers may rush orders ahead of implementation, and order volatility has increased modestly since September, though CATL has partly offset this by exploring new demand areas. The company is still negotiating pass-through with customers, but acknowledged that pass-through could be difficult for projects with finalized budgets and financing.

Day 2: ESVL visit

Background: The Xiamen Energy Storage Validation Research Institute (ESVL) is positioned as the world's largest and most comprehensive one-stop testing and validation platform for battery energy storage systems. Jointly established by the Xiamen Municipal Government and CATL, the facility broke ground in June 2024 and commenced operations on May 28, 2026. With total investment of c.Rmb3bn (~US$440mn) and a site area of 150 mu (~10 hectares), ESVL is designed as open global infrastructure to move the ESS industry from component-level testing toward full-system and station-level validation. Equipped with five laboratories, the facility stress-tests large-scale storage systems under extreme operating conditions to verify safety, grid-support capability and long-term reliability before commercial deployment.

Presenter: Dr. CHEN Xiaobo, Head of Xiamen Energy Storage Validation Research Institute

Top takeaways from the ESVL presentation are summarized below.

1. **ESS is moving from demonstration to empirical verification.** The industry needs to move beyond waiting for field failures and toward proactively identifying risks and validating performance before deployment.
2. **True system safety requires testing beyond components.** Many project failures, including water leakage and electrical design flaws, occur at the system-integration level. Component testing or simple simulation is no longer sufficient for a 20-year energy storage asset.
3. **Validation can make BESS a more predictable financial asset.** By stress-testing systems under high-voltage, low-temperature, communication-failure and other abnormal scenarios, ESVL helps make performance more transparent and asset returns more calculable.
4. **Laboratory testing can be more rigorous than field testing.** Field testing is constrained by the rarity of extreme events and the inability to push equipment to failure. Laboratory validation can simulate severe conditions and accelerate aging to test whether a system can support a 20-year life.
5. **CATL has built a comprehensive validation matrix.** The framework combines platform validation with scenario validation, covering both core technical performance and real-world application conditions.
    - **Platform validation** covers grid connection, thermal safety, environmental durability, power-system simulation, high-voltage testing and EMC.
    - **Scenario validation** covers power applications such as grid forming in Europe, zero-carbon industrial parks in China, AIDC in North America and solar-plus-storage in other regions, as well as environmental scenarios including high altitude, dust, marine climate and extreme cold or heat.

Investment Thesis, Price Target Risks and Methodology

Investment Thesis - CATL

CATL is the world's largest battery manufacturer, underpinned by leading scale, battery technology, and cost competitiveness. Its EV battery business remains a solid earnings anchor, supported by structurally expanding demand and a more resilient market-share trajectory following its recent share recovery. More importantly, CATL's transition from cells to integrated energy solutions, supported by its battery expertise and strategic ecosystem build-out, should open the next leg of value creation, as battery energy storage systems (BESS) integration enables share consolidation, higher project value capture, recurring service revenue, stronger margins, and a potential valuation rerating.

Price Target Risks and Methodology - CATL

Valuation methodology: We apply a SoTP framework to reflect CATL's distinct power battery and BESS growth profiles, BESS-led rerating potential, and ecosystem investments. For CATL-A, we value power batteries at 11x 2026-27E EBITDA and BESS using a discounted 2030E EV/EBITDA approach with an 18x exit multiple. For CATL-H, we use a global framework, valuing power batteries at 20x EV/EBITDA and BESS at a 25x 2030E exit multiple, reflecting CATL's superior ROIC, global leadership, and scarcity value. This yields 12-month TPs of HK$947/Rmb565 and implies a 54% H-share premium versus A-shares.

Key risks: 1) slower-than-expected global EV demand growth; 2) weaker-than-expected global ESS demand growth; 3) unexpected rise in raw material costs, mainly battery metals; 4) slower-than-expected progress in BESS integration; 5) execution and trade-policy risks in overseas expansion; 6) more intense-than-expected competition in power and ESS batteries.

300750.SZ	12m Price Target: **Rmb565.00**	Price: **Rmb304.63**	Upside: **85.5%**
3750.HK	12m Price Target: **HK$947.00**	Price: **HK$507.00**	Upside: **86.8%**

Buy

Market cap: Rmb1.5tr / $217.6bn
Enterprise value: Rmb1.2tr / $177.9bn
3m ADTV: Rmb12.0bn / $1.8bn
China
China Battery, Machinery & Advanced Materials
M&A Rank: 3
Leases incl. in net debt & EV?: Yes

GS Forecast

	12/25	12/26E	12/27E	12/28E
Revenue (Rmb mn)	423,701.8	598,596.9	712,248.9	787,315.3
EBITDA (Rmb mn)	100,832.9	136,728.3	169,419.5	196,913.8
EPS (Rmb)	16.04	20.19	24.77	28.88
P/E (X)	18.5	15.1	12.3	10.5
P/B (X)	4.0	3.5	3.1	2.7
Dividend yield (%)	2.7	3.7	4.1	4.7
N debt/EBITDA (ex lease,X)	(2.1)	(2.2)	(2.3)	(2.5)
CROCI (%)	37.4	33.7	39.1	42.4
FCF yield (%)	6.6	6.5	8.9	10.5

	3/26	6/26	9/26E	12/26E
EPS (Rmb)	4.40	4.79	5.16	5.84

Source: Company data, Goldman Sachs Research estimates, FactSet. Price as of 22 Sep 2026 close.

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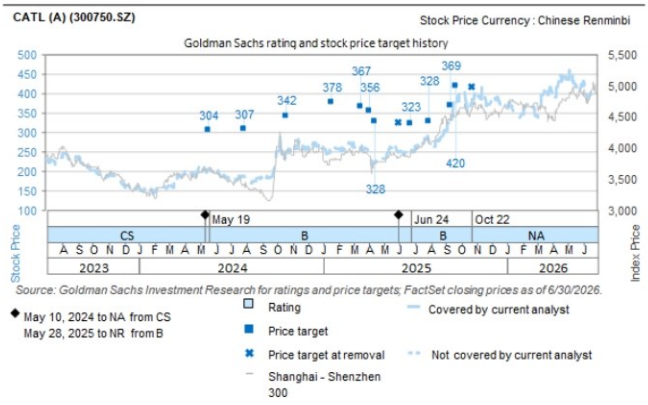
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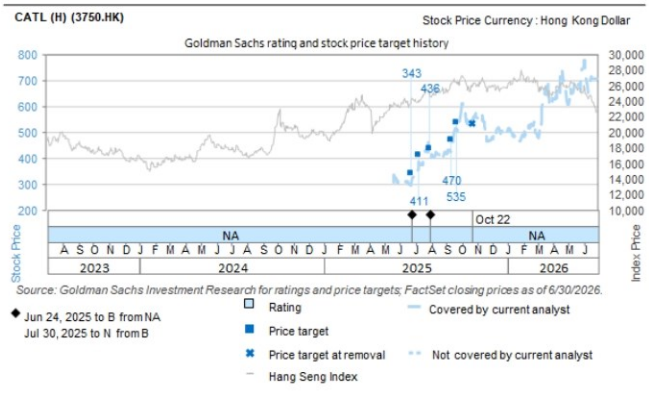
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Target price history table(s)

CATL (A) (300750.SZ)

Date of report	Target price (Rmb)	Closing price (Rmb)
24-Jul-26	565.00	383.01
08-Jul-26	566.00	361.00
21-Sep-25	420.00	368.49
11-Sep-25	369.00	322.55
30-Jul-25	328.00	277.09
24-Jun-25	323.00	245.92
14-Apr-25	328.00	224.00
04-Apr-25	356.00	243.08
16-Mar-25	367.00	262.00
19-Jan-25	378.00	251.50
20-Oct-24	342.00	249.89
28-Jul-24	307.00	189.35
19-May-24	304.00	203.00

CATL (H) (3750.HK)

Date of report	Target price (HK$)	Closing price (HK$)
24-Jul-26	947.00	622.00
08-Jul-26	946.00	628.00
21-Sep-25	535.00	515.50
11-Sep-25	470.00	428.80
30-Jul-25	436.00	426.60
09-Jul-25	411.00	385.00
24-Jun-25	343.00	303.00

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