How We Make HyperStrong Energy Storage Systems

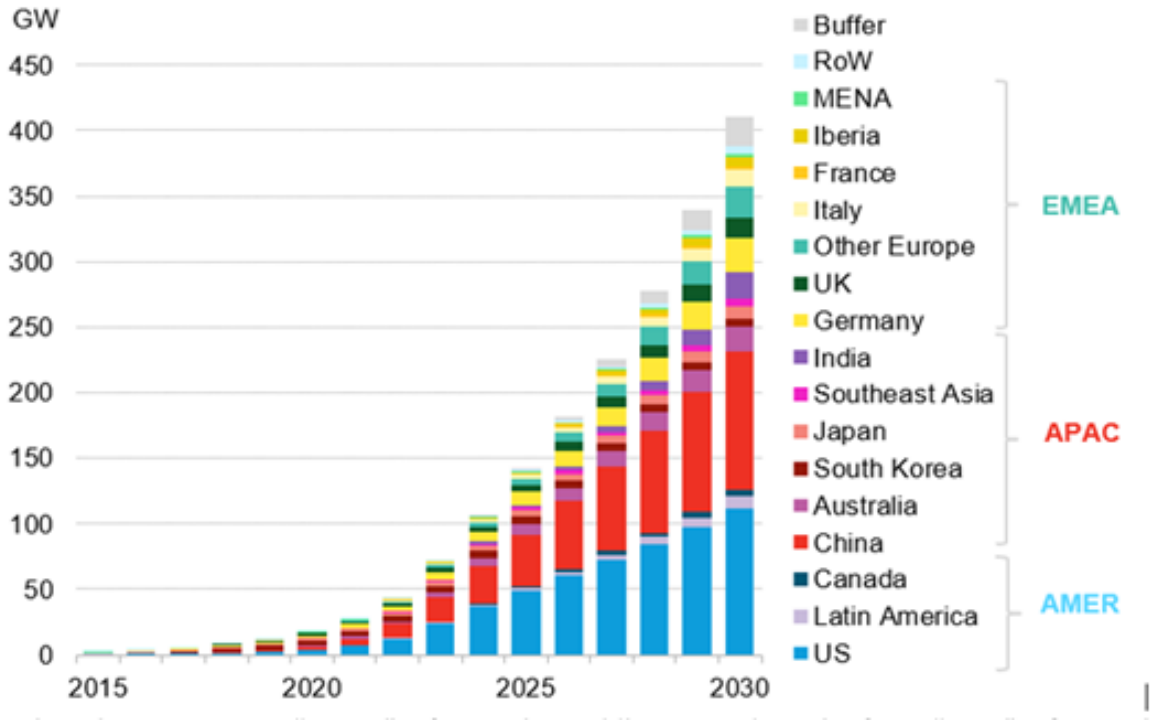
Dr. Guang Yang, HyperStrong Inc.

EMPOWERING A SUSTAINABLE FUTURE

Global ESS Market Growth

- Expected to grow at 13% CAGR.
- Cumulative ESS installation projected to reach 411GW by 2030, which is 15 times of the end of 2021
- A-Pac, US, Europe lead the world

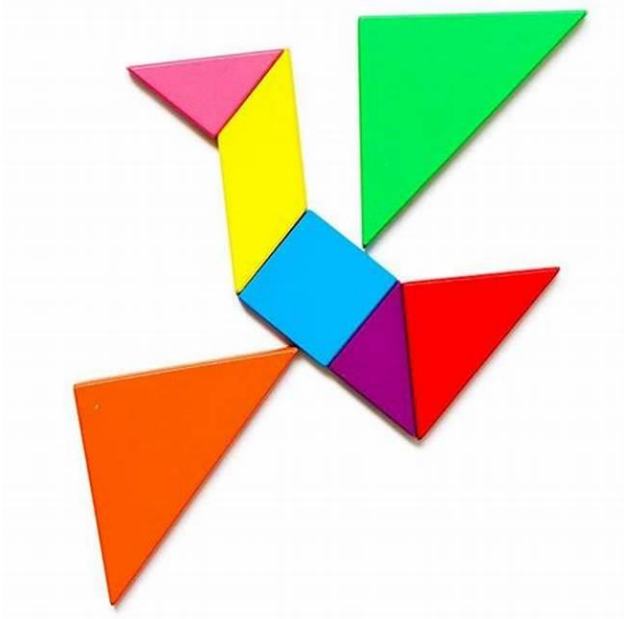
A large number of companies rush into the field of energy storage system integration.



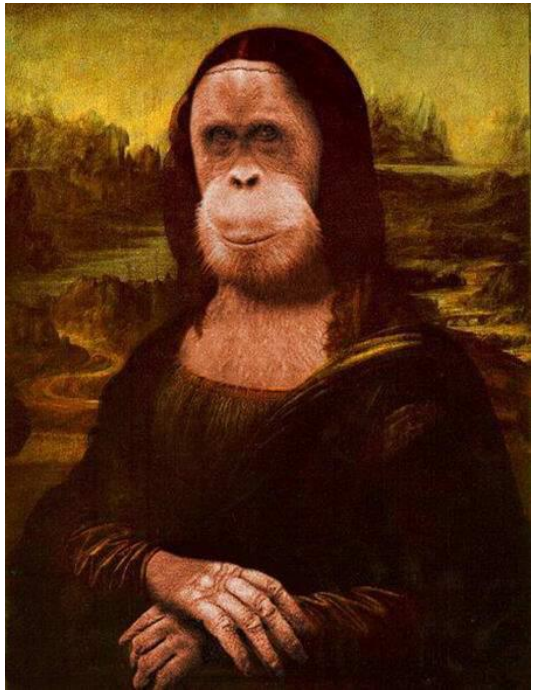
Global cumulative energy storage installations, 2015-2030

BloombergNEF

How are weak energy storage systems made

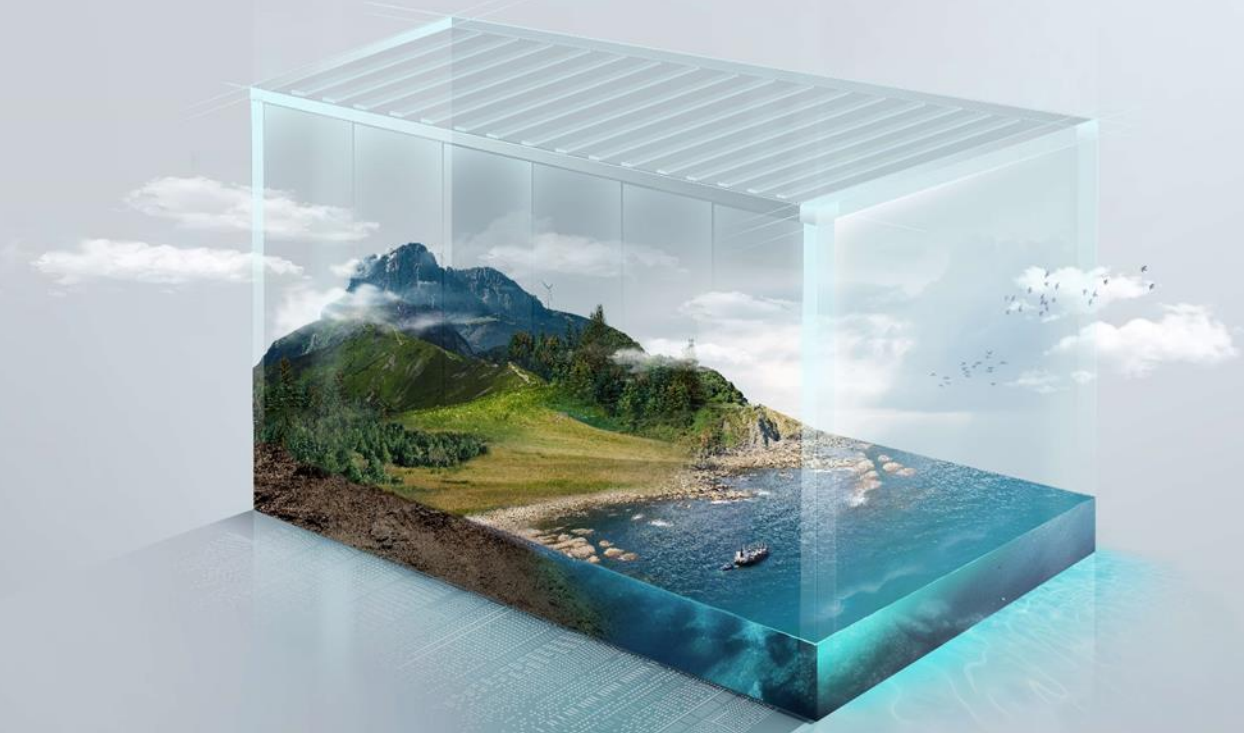


- Acquire all building blocks
- Simply put them together
- Rely on vendors to integrate
- No technology accumulation
- May go from inefficient to wrong



How we make HyperStrong energy storage systems

- R&D core technology and products
- Full life cycle data management
- Stringent quality control
- Safe, Efficient and Long life



A Very Brief Introduction:
We dedicated ourselves on BESS for more than a decade since 2011

12+ years
BESS R&D

300+
Projects completed

HyperStrong

Since 2011

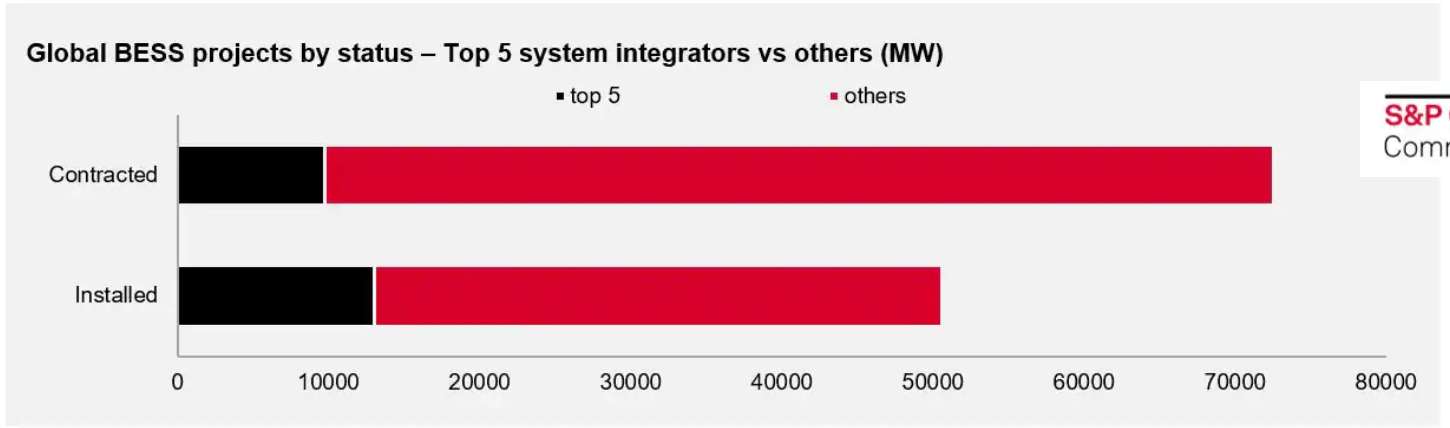
Global Leader
in Energy Technology Innovation

12+ GWh
Deployed

15+ million
Cells analyzed

0 safety issues

Global leading position with ranking as TOP 5



Data compiled July 2023
Fluence = Fluence Energy Inc.; Sungrow = Sungrow Power Supply Co. Ltd.; Wärtsilä = Wärtsilä Corp.; Hyperstrong = Beijing Hyperstrong Technology Co. Ltd.
Note: "Installed" = completed (e.g., the asset has been installed on site and is waiting for grid connection) and operational projects. "Contracted" = financed (the integrator has been selected, but de projects are included. All project data based on project database from S&P Global Commodity Insights Clean Energy Technology Analytics.
Source: S&P Global Commodity Insights.

TOP 5

BESS Integrator Globally

Source: S&P Global Commodity Insights

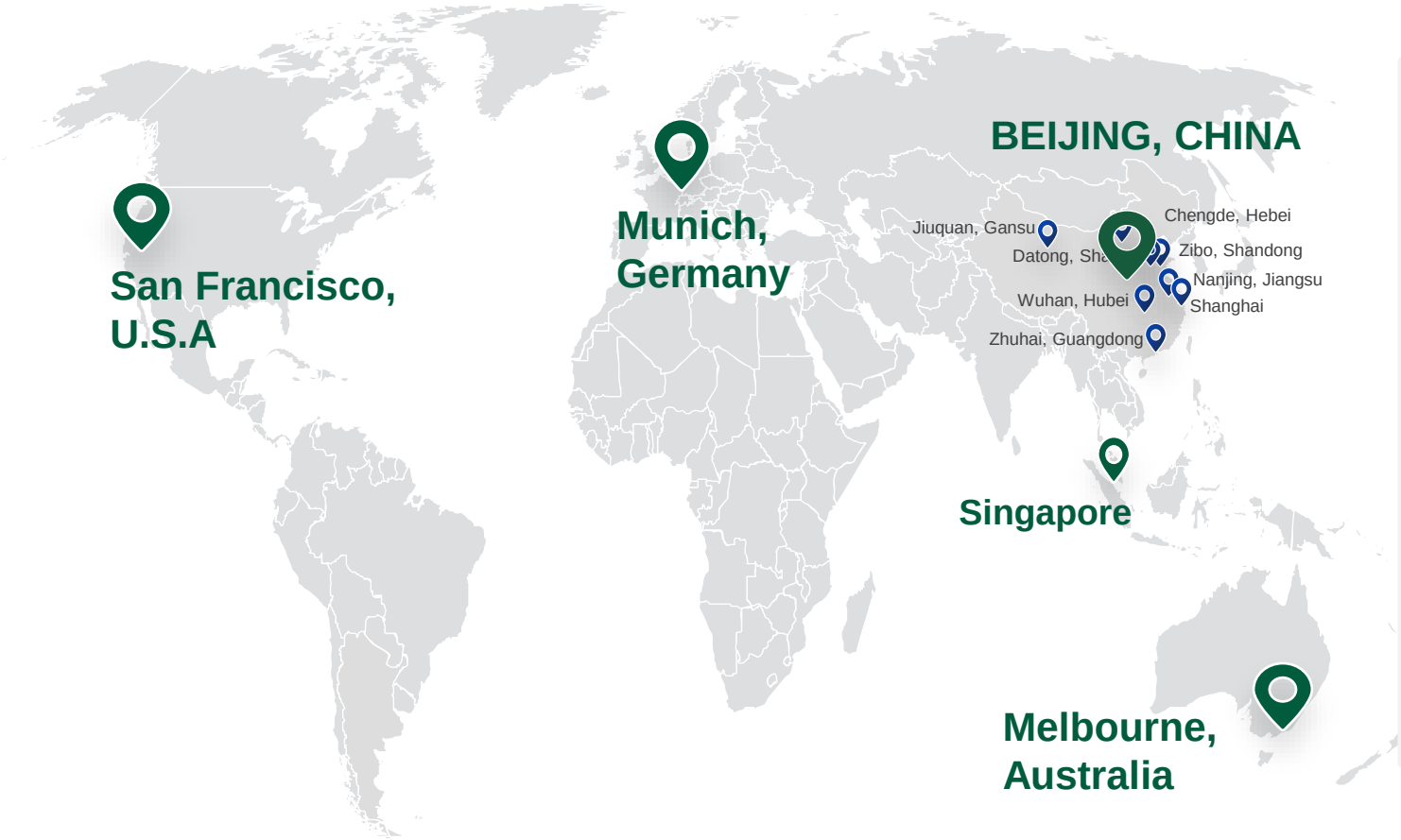
NO.1

ESS Integrator in China

for 3 Consecutive Years

Source: China Energy Storage Alliance (CNESA)

Long-term commitment to the global development with four major regional markets and local O&M capabilities



6 INTELLIGENT MANUFACTURING BASES

Northern Region
Beijing
Datong, Shanxi
Chengde, Hebei

Northwestern Region
Jiuquan, Gansu

Eastern Region
Zibo, Shandong

Southern Region
Zhuhai, Guangdong

2 R&D CENTERS

Beijing
Wuhan, Hubei

2 TESTING CENTERS

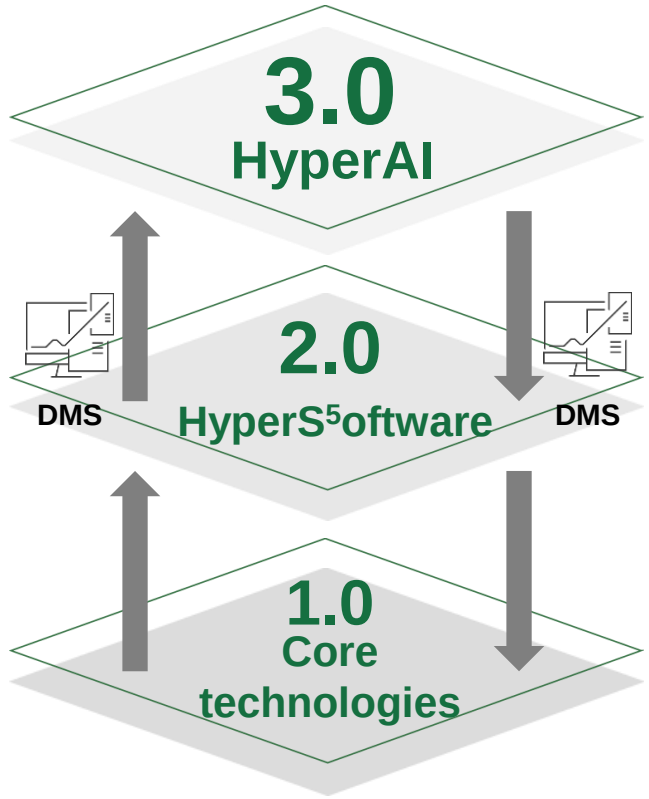
Beijing
Zhuhai, Guangdong

O&M CENTER
Nanjing, Jiangsu

DOMESTIC MARKETING CENTER
Shanghai

The Making of HyperStrong ESS:
R&D core technologies and products

Safe + Low LCOS + Efficient + Reliable + Long life + Smart = Hyper Strong



BMS

LCS

DMS

DMS

PMS

EMS

Battery cell

structural components

integrated circuit

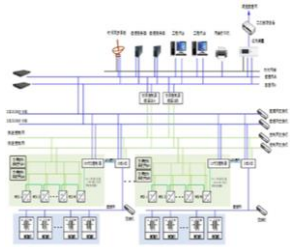
electrical components

fire suppression

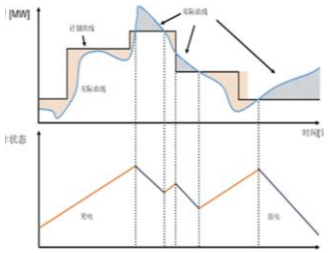
air conditioning

Integrated energy applications Power safety and security Grid ancillary services Renewable energy generation

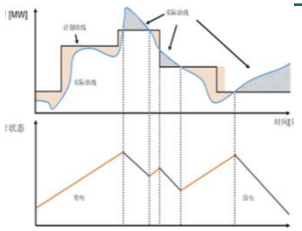
All Key Control Components in ESS with own IPs



Accurate response to grid dispatch instructions
Real-time assessment of power station capacity and auxiliary decision-making for trading operation.

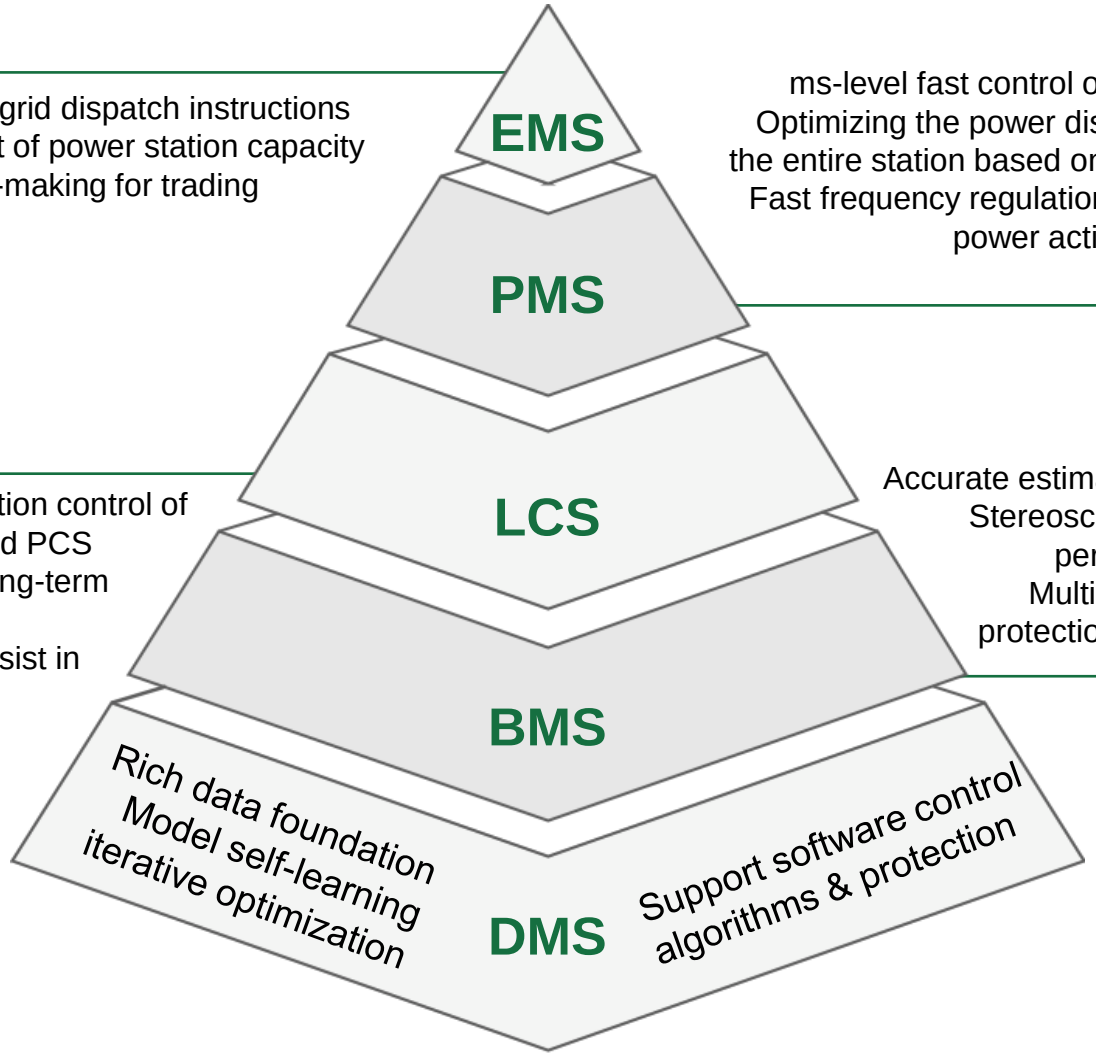


ms-level fast control of power coordination
Optimizing the power distribution strategy for the entire station based on battery consistency
Fast frequency regulation & dynamic reactive power active response support



Collaborative optimization control of energy storage unit and PCS
Automatic control of long-term battery balancing
Local AI analysis to assist in equipment diagnosis

Accurate estimation of battery status
Stereoscopic control of battery performance boundaries
Multidimensional control & protection linkage mechanism

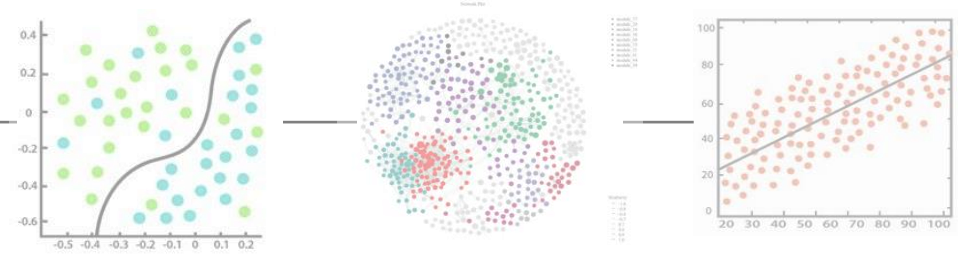


The Making of HyperStrong ESS:
Full life cycle data management

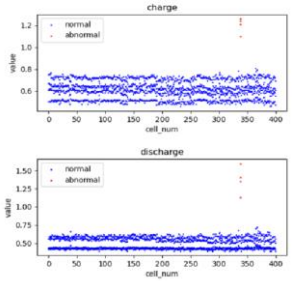
Scenario Value Assessment	Procurement Evaluation	System Design	Quality Control	Intelligent Operation and Maintenance	System Optimization

R&D Data → Manufacture Data → Engineering Data → Operation & Maintenance Data

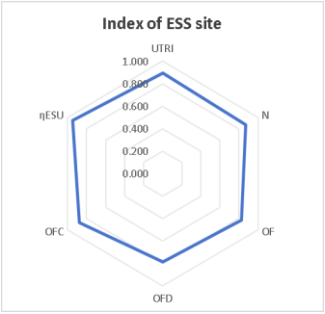
Digital Model → **Algorithm Strategy** → **Control& Protection Strategy**



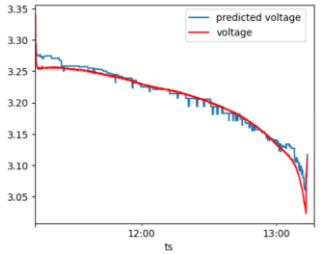
Analysis & Optimization



HyperAI Safety Analysis



HyperAI Performance Analysis



HyperAI Lifetime Analysis

Procurement Evaluation

Test Facility

Established in January 2016 with an investment of nearly 200 million RMB. Include two parts: a comprehensive test center (6500 square meters) and a safety laboratory (850 square meters); More than 30 R&D personnel, with a master's and doctoral degree accounting for 70%; Independently developed a comprehensive battery and system testing grading evaluation system and enterprise standard; Evaluated and analyzed nearly a hundred products of over 50 domestic and foreign energy storage battery companies, and have accumulated rich data.

Test Capabilities-Domestic
GB/T 36276-2018，GB/T 34131-2023，GB/T 36548-2018，GB/T 34133

Test Capabilities- Overseas
UL1973-2022(North America), UL 9540A (North America), VDE 2510-50 (Germany), IEC 63056, IEC 62477-1, IEC 62619, IEC 60529 (Europe), UN 38.3 (Overseas Transportation)

Qualifications

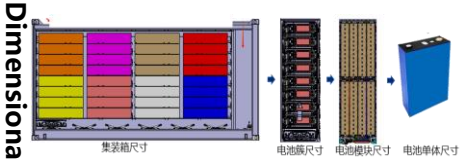
CNAS　MA　CQC　TÜVRheinland　CSA US

Comprehensive Battery Qualification Testing

The rapid development and technological iteration of the energy storage industry have gradually highlighted the industry's challenges (battery definition, battery selection, quality control, and digital multi-dimensional integration), which are the problems that need to be solved in the future. It is crucial to establish a complete battery lifecycle management and control technology system.

HyperStrong's Approach

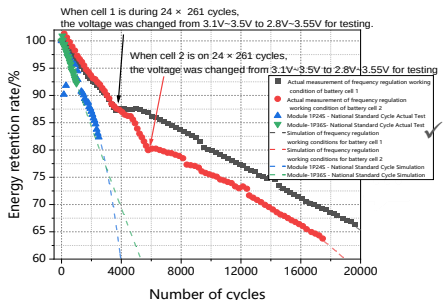
Dimensional decomposition



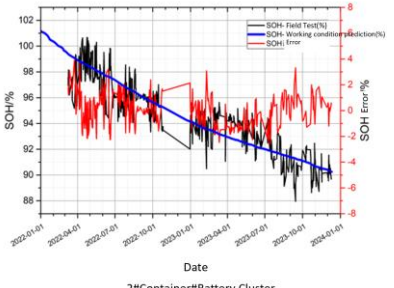
Ultimate safety

- ✓ **Physics**: Battery size
- ✓ **Key performance**: Lifespan, Efficiency, and Safety
- ✓ **New Technology**: Solid State Batteries

Lifetime assessment



System Lifetime



- ✓ **Different periods:** selection data, performance mining data, and operational data
- ✓ **Different states:** individual, module, system
- ✓ **Key performance:** efficiency, lifespan, safety

①Battery Character.

How to define battery performance indicators

②Battery Selection

How to test battery performance

Industry challenges

④Performance Continuity

How to connect and analyze the data of batteries in different periods and states

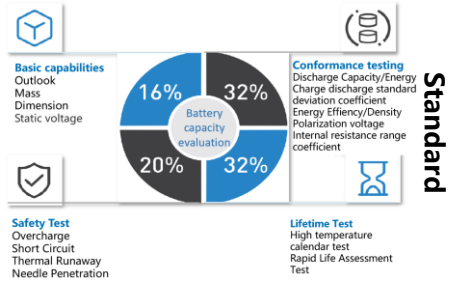
③Quality Control

How to ensure the quality of the entire lifecycle after the introduction of batteries

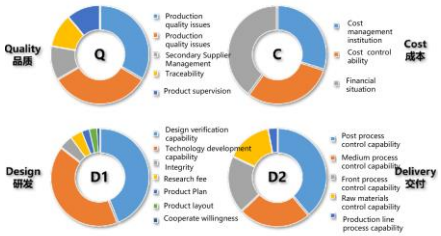
HyperStrong's Approach

- ✓ **Digital Modeling** - Battery Selection Standards
- ✓ **On site audit** - production line audit
- ✓ **Technical Layout** - Production and Manufacturing Processes

Selection Standard

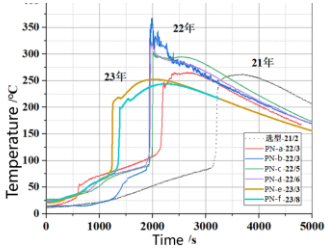


Factory audit standards

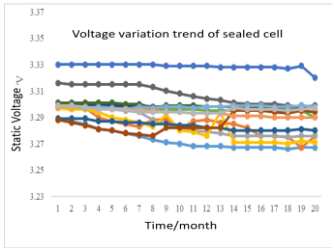


- ✓ **Protocol Protection** - Technical and Quality Agreement
- ✓ **Pre integration control** - analysis of different batches, retention and sealing of samples, etc.
- ✓ **Integrated Management** - Integration and Operational Data Analysis

Batch Analysis



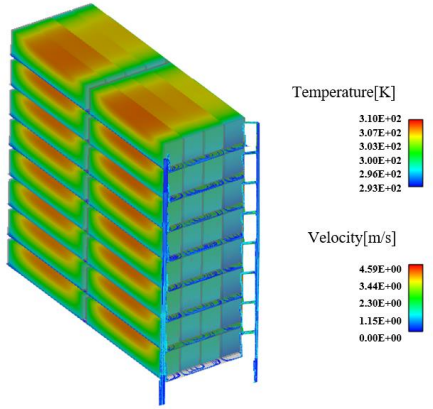
Sample retention analysis



HyperAI Digital Modeling

Construction and verification of battery cluster thermal management platform

Simulation analysis

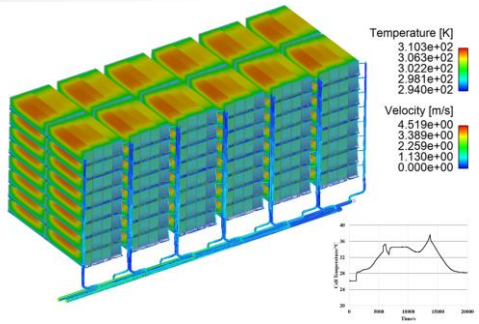


Sample verification

Construction and verification of prefabricated cabin thermal management platform

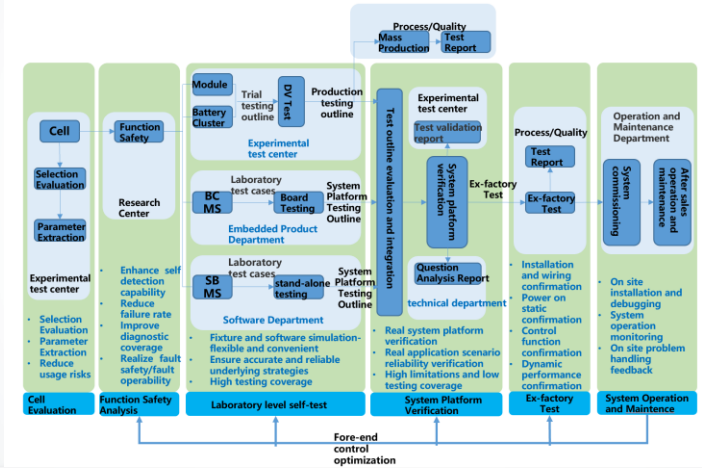
02

Simulation Analysis



Sample Verification

Full process platform construction



Standard Test Outline for Liquid Cooling Energy Storage Systems

04

Standard Test Outline for Liquid Cooling Energy Storage Systems		
Test Sample	**Category**	**Test item**
Energy Storage system	Installation wiring inspection	94
	Power on communication inspection	165
	Static functional inspection	52
	Dynamic performance testing	12
Battery Cluster	General requirements	38
	Electrical performance Test	10
	Environmental condition testing	10
	Safety Performance	3
High Voltage Box	General requirements	24
	Structure Test	1
	Environmental condition testing	3
Battery Module	General requirements	13
	Electrical performance Test	11
	Safety Performance	11
	Environmental condition testing	7
Total		454

Manufacture: Battery Cell Management System

The cell management system, the most important piece in MES, collects battery cell factory data, inventory management data, and battery cell usage data to accurately control battery cell batches and ensure the consistency of battery cells on energy storage products.

Battery Cell Management System

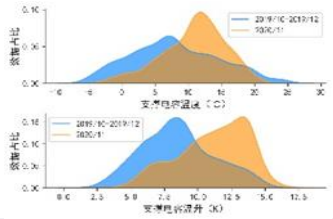
Shipping data	1. Setup web services for vendors 2. Receive data online in real time	Consignment Norm dist. analysis
Cell management	1. Developed automation tools 2. Manage battery incoming and outgoing activities	Consignment data graph analysis
Analysis Reports	1. Lab analysis of battery cell 2. Email push analysis report	Battery cell sampling analysis
Statistical Reports	1. Multi-time dimension report 2. Digest shipping, storage and consumption data	Inventory analysis
Test data	Battery cell quality inspection data	High risk battery cell recognition

Battery Statistics Report

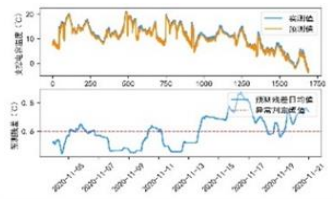
Battery Analysis Report

Battery Misuse Alarm

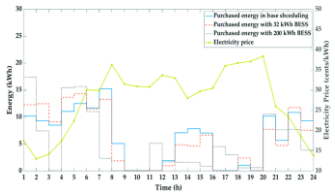
HyperCloud intelligent O&M system safeguards long-term value for customers throughout the full battery life cycle



Early warning



Rapid fault localization



Dynamic adjustment of operation & protection strategies

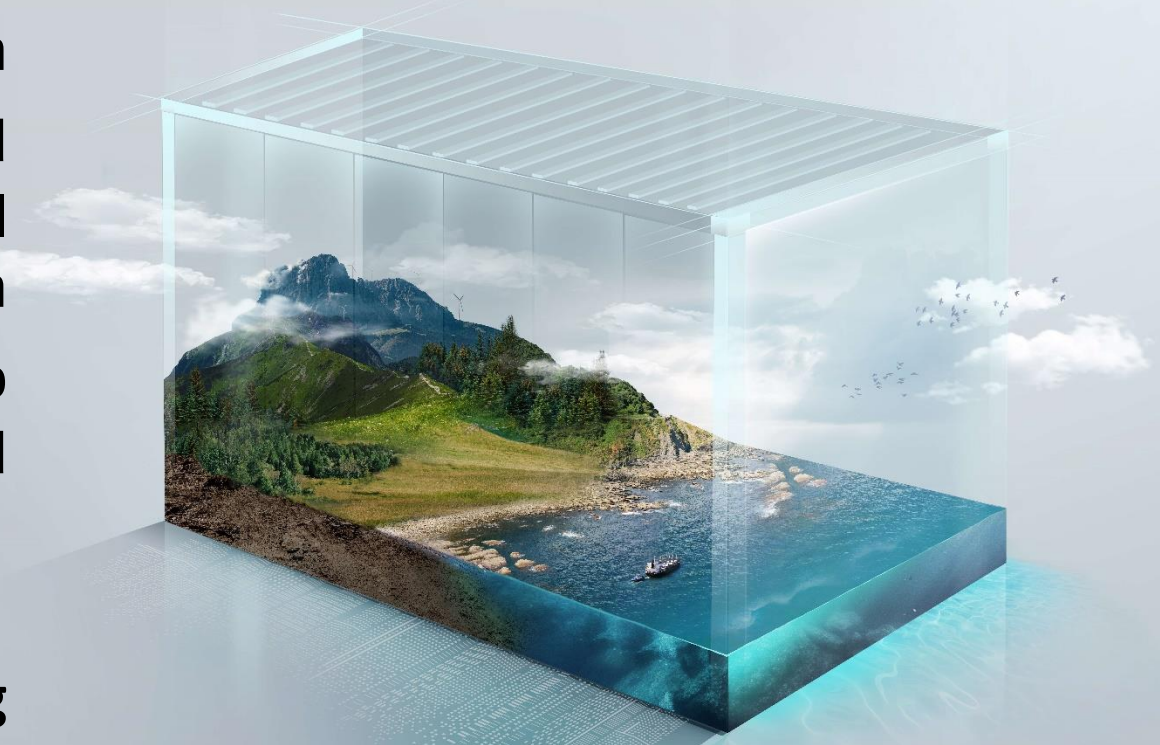
Guarantee ESS Safety, Efficiency, Longevity

"The world’s most valuable resource is no longer oil, but data."

- The Economist

"The BESS industry is undergoing a transition from the 2.0 to the **3.0 era,** centered around achieving interconnectedness of all underlying data. Realizing analysis based on **AI** and **big data** models, it aims to enhance the overall efficiency, safety, and lifespan of BESS."

- Chairman&CEO Dr. Jianhui Zhang



HyperStrong offers a one-stop competitive product portfolio for all scenarios

Utility-Scale

HyperBlock III

Liquid-cooling BESS
AC+DC
5MWh

HyperBlock II

Liquid-cooling BESS
DC
3.72MWh

Commercial & Industrial

HyperCube-max

Air-cooling
All-in-One BESS
2.86MWh

HyperCube

Liquid-cooling
Outdoor Cabinet
232.9kWh/372.7kWh

Residential & Mobile

HyperBox

Residential BESS
5-20kWh

HyperMobile

Mobile BESS
vehical
kWh-MWh

ESG framework sets our priorities for sustainability

2024

Quantify and certify the carbon footprint of the main products

2025

Certify the first carbon-neutral factory

2026 and on

Promote the clean future

Social

Always offering equal and open opportunities for workers among all genders, ages and nationalities

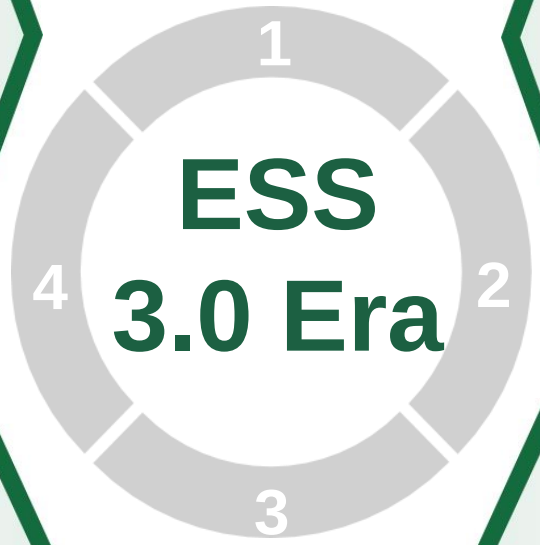
Environmental

Actively adopting international standards to account for the total emissions, and simultaneously formulating strategies, targets and paths to address climate change

Governance

Already establishing a specialised integrated governance mechanism, and a comprehensive, scientific and systematic governance system from the perspective like anti-corruption

Summary- How We Make HyperStrong Energy Storage Systems



R&D core technology & products

More than a decade dedicated to ESS technology and products

Proprietary components enable efficiency and integrity

Full life cycle data management

Comprehensive battery cell testing data
Manufacturing process data
O&M data
Digital models of above all

Stringent Quality control

Procurement control
Battery cell management
Manufacturing process control

Products and services

Complete ESS product portfolio
Guarantee safety, efficiency, longevity
Intelligent O&M capabilities
ESG compliance

Thank you!

Welcome to our booth for more discussion.

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Product Inquiry

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Project overview

Intelligent project success stories

Record-breaking project success stories

Applicable to all energy storage scenarios

Adapting to all extreme environment conditions

Project cases | Utility-scale BESS

101MW/202MWh

Haiyang, Shandong

100MW/212MWh

Ge’ermu, Qinghai

100MW/201MWh

Datong, Shanxi

101MW/202MWh

Jining, Shandong

Project cases | Renewable Energy BESS

100MW/400MWh

Altay, Xinjiang

250MW/1000MWh

Santanghu, Xinjiang

Project cases | C&I and Distributed BESS

20MW/80MWh

C&I ESS - Suqian, Jiangsu

500kW/1164.8kWh

Distributed ESS - Zhongshan, Guangdong

Project cases | Adaptation to all extreme conditions