GOLD ELECTRONIC

BMS+
Technology Ecosystem

GOLD Full-Stack Solution

GOLD

Sustainable Development Strategy

Guarding the security of the

Energy supply system

Contributing to the Development

Of Green Energy

Table of Contents

Hangzhou Gold Electronic Equipment Co., Ltd.

1998
Date of Establishment

100+
Patents in China and Abroad

10000+
Project Cases

23%
Global Market Share

GOLD Electronics is a nationally recognized high-tech enterprise, driven by technological innovation, serving the new energy industry by providing energy storage battery management systems, data services, and full-stack solutions for commercial and industrial energy storage.

Since its establishment in 1998, GOLD has been deeply involved in the new energy field, achieving a strategic upgrade from BMS core hardware to full-stack solutions, and building a technology system covering three core sectors.

GOLD reconstructed the value of energy storage with a full-stack technology system, committed to becoming the benchmark for full-stack energy storage solutions.

Vision

Guarding the security of energy systems and contributing to the development of green energy

1998

Born at the Right Time

Successfully Developed the First Domestic Battery Monitoring System

2009

Industrial Upgrading

With backup power BMS as the main product
Serving the State Grid
Pioneering Dynamic Discharge DC Internal Resistance Testing Technology
Successfully Developed Wireless Battery Detection Products

2010-2018

Technological Breakthrough

Successfully developed energy storage and vehicle BMS products
Successfully developed bidirectional active balancing technology
Co-developed AFE information acquisition and active balancing chips

2019-2021

Riding the Momentum

AFE Information Acquisition Chip Usage Exceeds 300k pcs
Bidirectional active balancing chips have begun mass commercial deployment
Ranked first in domestic third-party BMS shipments for energy storage in 2021

2022-2024

Outstanding Achievement

2022-2024 energy storage BMS product delivery
Corresponds to rapidly increasing installed capacity
Continuously maintain industry leadership
BMS + industrial ecosystem layout
Integrated monitoring of single-cell sensors and temperature-controlled safety valves, and development of second-generation AFE acquisition chip

2025

Braving New Heights

Second-Generation BMS Market Promotion; Steady Increase in Domestic Market Share; Continuous Expansion of Overseas Business; Enhancement of Global Brand Influence; Continuous Improvement of Integrated Centralized Control and Data Services; Building a Second Growth Curve

2026

A New Voyage

Strategic Upgrade to a Global Energy Service Provider
Leading Regional Power Market
Building an "Offline + Field" Smart O&M Service System and a Global Localized Service Network

Technological Innovation

Safety Diagnostic Revenue Return

Core operational indicators for energy storage power stations

Online Rate
Determines "How long it runs per year/month/day"

Operational Efficiency
Determines "how well it runs"

Depth of Charge/Discharge
Affects "how far it can run on a single charge"

Capacity Degradation Rate
Relates to "How many years it can run"

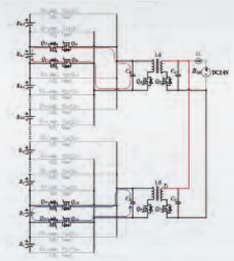
Safety diagnosis
Real-time monitoring of system status, early warning, and troubleshooting of safety faults

Economic Benefits
Maximizing the comprehensive value and profit margin of power station operation

Core Technologies

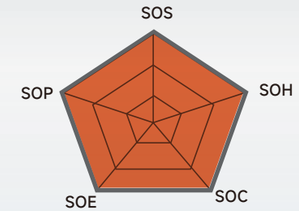
Bidirectional Active Balancing Technology

Power Bus Bidirectional Active Balancing Topology
No additional wiring harness, direct energy transfer for any cell
Intelligent Adaptive Algorithm, Charge/Discharge Synchronous Balancing
Efficient Energy Transfer, Higher Balancing Efficiency



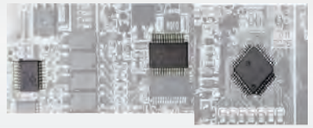
Safety Diagnostic Technology

Self-learning neural network model, adaptable to various battery types
Multi-Level Full Lifecycle Battery Diagnostic
SOC Accuracy ≤2%, SOH Accuracy ≤3%



Domestic Chips

Collaborative R&D of BMS Core Chips Since 2017
Successfully developed AFE acquisition chip and active balancing chip
Possesses independent intellectual property rights and is in mass commercial use
Significant Cost Advantage



Bidirectional Active Balancing Chips GT3801/GT4801

AFE Acquisition Chip GT1812/GT2818

Power Station Economic Model

Project Case: Gansu 40MW/80MWH Active Balancing Project Practice
Verification Commissioning Time December 2022 Full Container Equipped with Active Balancing System

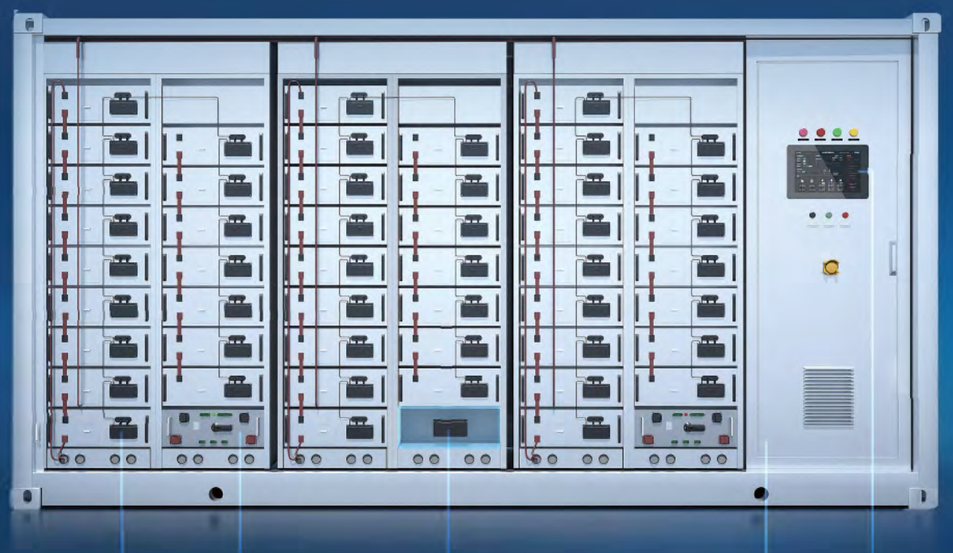
Cycle Life (to 80% SOH)
3000 cycles Passive Balancing
4000+ Times Active Balancing

Battery Replacement Cycle
10 Years Passive Balancing
15 Years+ Active Balancing

Operations and Maintenance Cycle 3-5 Extended To Years
Fault Risk ↓60-80%
Battery Stack Service Life >20%
Operation and Maintenance Costs ↓50%
Cell Capacity Consistency 3% Differential Control
Energy Storage System Revenue >20%

Data is for reference only; actual measured data from the project shall prevail.

GOLD BMS Solution



ESBMM
Primary Battery Management Module

ESBCM
Secondary Battery Cluster Control Management Module

ESMU
Three-level Battery Stack Control and Management Host

ESHVB
High-voltage Box

ESSCB
Combiner Cabinet

Energy Storage BMS Product Parameters

Battery Management Module -- ESBMM Series

Type	Model	Supply Voltage	Withstand Voltage	Voltage String Count	Voltage Range	Number of Temperature Detection Points	Temperature Detection Range	Balancing current	Communication and Indication Interface	Dimensions (Length*Width*Height/mm)
Primary Slave Control Passive Balancing	ESBMM-1212-F HV6.0.0	DC24V	DC5370V	12	0-5V	14	-40~125°C	100mA	CAN	120*100*27
	ESBMM-2412-F HV7.0.1		DC6700V	24		24				159.5*105*25
	ESBMM-3612-F HV7.0.1		DC6700V	36		36				202*105*25
	ESBMM-4812-F HV7.0.1		DC6700V	48		48				287.1*105*25
	ESBMM-6012-F HV7.0.1		DC6700V	60		60				287.1*105*25
	ESBMM-1612-F HV7.0.7	/	DC6400V	16		16			IP/IM	111*71*20
	ESBMM-3212-F HV7.0.7		DC6400V	32		32				161*71*20
	ESBMM-4812-F HV7.0.7		DC6400V	48		48				209*71*20
	ESBMM-6412-F HV7.0.7		DC6400V	64		64				256*72*20
	ESBMM-B212-F HV7.0.7		DC6400V	112		112				285*105*40
	ESBMM-6412-F HV7.1.0	DC24V	DC6400V	64		64			CAN	256*72*20
	ESBMM-B212-F HV7.1.0		DC6400V	112		112				285*105*40
Primary Slave Control Active Balancing	ESBMM-1222-F HV4.0.6	DC24V	DC5370V	12		14		2A	CAN	122.5*98.6*21
	ESBMM-1622-F HV4.0.6		DC5370V	16		16				159.5*105*25
	ESBMM-2422-F HV4.0.6		DC5370V	24		24				188*105*20.5
	ESBMM-2622-F HV4.0.0		DC5370V	26		26				188*105*20.5
	ESBMM-5222-F HV5.0.0		DC5370V	52		56				285*105*23
	ESBMM-A422-F HV5.0.0		DC5370V	104		112				285*105*40
Primary Slave Control Pressure Relief Valve Detection	ESBMM-7212-F HV8.0.0		DC6400V	72		72		100mA	IP/IM	256*72*20
	ESDBM-1312-F HV8.0.0		DC6400V	13		14				89*79*23
	ESDBM-1322-F HV8.0.0		DC6400V	13		13		2A		89*79*23

Battery Cluster Control Management Module - ESBCM Series

	Model	Supply Voltage	Withstand Voltage	Group Terminal Voltage Range	Current Range	Insulation Resistance	Communication Interface	DO	DI	Length * Width * Height (mm)
Secondary Master Control	ESBCM-F133-L-S HV5.0.1	DC24V	DC5370V	0~1500V	0~2000A	≥10MΩ2500VDC	LAN*1/CAN*3/485*1/IPIM*2	8	8	225*110*27
	ESBCM-F133-L-S HV6.0.0						LAN*2/CAN*3/485*1/IPIM*2 Expandable 4G Bluetooth WiFi			247*110*27
	ESBCM-F133-F-S HV6.1.0						Fibre*2/CAN*2/485*1/IPIM*2			225*110 (+8) *27

Battery Stack Control and Management Host - ESMU Series

	Model	Supply Voltage	CAN	RS485	LAN	Screen Size Attribute	4G Module	DI/DO	Storage	Length * Width * Height (mm)
Three-level Display and Control	ESMU-100256 HV2.0.1	DC24V	3	5	3	10-inch	无	12 groups of IO + 1 channel AC detection	240/500G SSD/ Configurable	288*190*41.2
	ESMU-1002564G HV2.0.1		3	5	3	10-inch	Built-in Standard	12 groups of IO + 1 channel AC detection	240/500G SSD/ Configurable	288*190*41.2

High-voltage Box

The ESHVB High-voltage Box is the management unit for the high-voltage power circuit of the battery rack, featuring functions such as battery cluster voltage and current collection, and cluster circuit contactor control and protection.

Function Description

Supports AC-220V Cluster Power Supply or DC-24V Cluster Power Supply;
Supports battery cluster terminal voltage detection, terminal current detection, and battery cluster insulation status detection;
Supports digital signal input detection, switch status signal detection;
Supported system parameters: Battery cluster voltage ⩽1500V, battery cluster current ⩽400A;

High-voltage Control Box ESHVB Series

Model	Applicable Systems	Circuit breaker/ Isolating switch	Contactor	Fuse	Breaking Capacity	Dimensions (Width X Depth X Height)	Applicable Systems
ESHVB-25CA-OT	DC1000V	250A	250A	315A	50KA	420*510*210	Air Cooling
ESHVB-25CA-HC		250A	250A	315A	50KA	400*510*200	
ESHVB-40CA-OT		400A	400A	500A	50KA	480*550*240	
ESHVB-H-25CA-OT	DC1500V	250A	300A	350A	250KA	420*510*210	
ESHVB-H-25CA-HC		250A	300A	350A	250KA	400*510*200	
ESHVB-H-40CA-OT		400A	400A	450A	150KA	480*550*240	
ESHVB-H-25CA-F-IP54-OT		250A	300A	400A	250KA	480*600*160	Liquid Cooling
ESHVB-H-25CE-IP54-HC-L-V1.0 (Commercial & Industrial Storage)		250A	300A	400A	250KA	500*600*200	
ESHVB-H-25CA-IP54-HC-L-V1.0 (Plastic Shell Version)		250A	300A	400A	250KA	480*451*172	

Customizable according to project requirements

Combiner Cabinet

The energy storage system combiner cabinet is a DC high-voltage power circuit stack-level management unit specially designed for energy storage systems. It is an intermediate unit connecting the battery stack and the energy storage converter, possessing functions such as battery stack-level bus combination, battery stack power circuit breaker control and protection.

Function Description

Supports multi-cluster confluence (optional); Supports AC-220V power supply;
Supports power supply to the Energy Storage Battery Management Module ESMU;
Supports RS-485, CAN, ModbusTCP, IEC104, IEC61850 communication protocols;
Supports switch output, capable of controlling power distribution interruption, busbar circuit breaker/disconnect switch opening and closing, etc.;
Supported system parameters: Battery stack voltage ⩽1500V, battery stack current ⩽2500A;

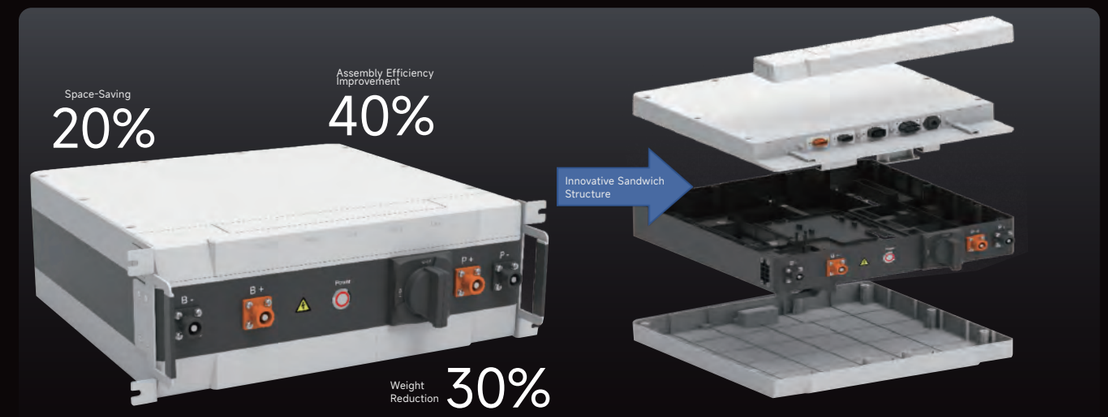
Customizable according to project requirements

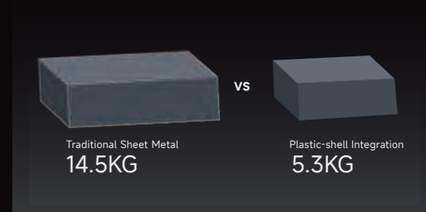
Protection During Events

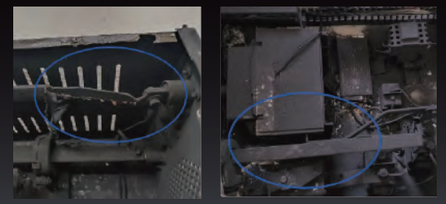
Plastic-Shell High-Voltage Box

Flame Retardancy | Electrical Insulation | High corrosion resistance | High Strength

The new generation plastic-shell integrated high-voltage box is an upgrade from the standard energy storage high-voltage box, using PBT+GF30 injection molding process to replace the traditional sheet metal shell, achieving lightweight while enhancing safety and insulation levels; the innovative "sandwich" structure significantly improves production efficiency.







Traditional Sheet Metal Enclosure
Prone to Corrosion and Aging in Complex Environments; Electrical Safety Defenses are Fragile

Post-event Tracing

Fault Recording

Dedicated Intelligent Monitoring Device for Energy Storage Systems, Built-in Protection System, Automatic Rapid Response to Extreme Conditions like Fire, High-precision Data Collection Safeguards Data Security

128GB Ultra-Large Memory Space

30000+ Fault Records — Data Traceable Back to Several Months Ago

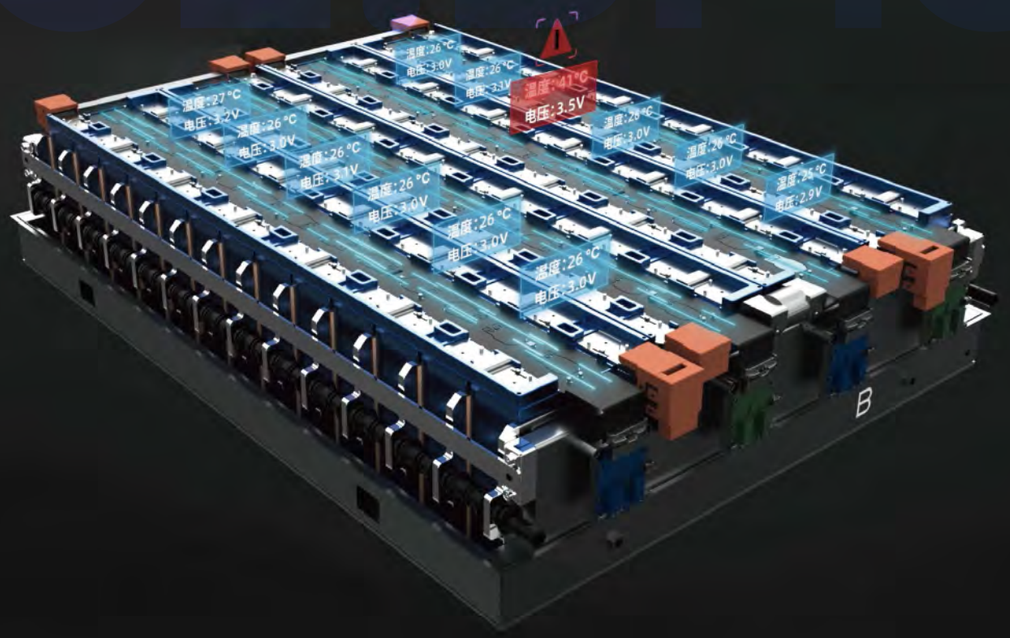
10min Operating Duration During Power Outage

350°C External Extreme Temperature

100G Impact Resistant

Energy Storage Technology Innovation

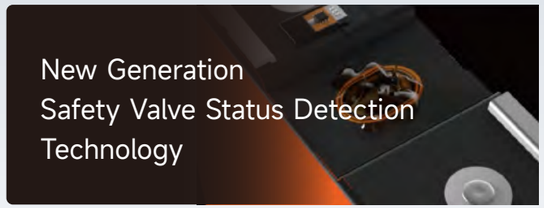
GOLD Defines Next-Generation
Multi-Dimensional Sensing Technology

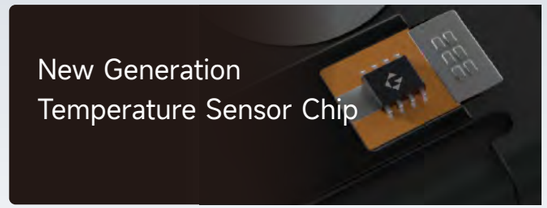


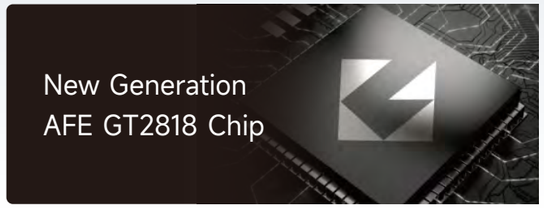
Pre-event Warning G2.BMS

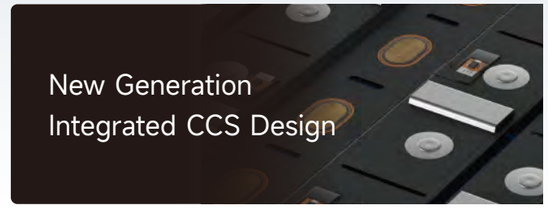
GOLD pioneered the synchronous acquisition of three parameters: voltage, temperature, and safety valve status, elevating battery thermal runaway detection from the "container level" to the "cell level," achieving millisec-ond-level early warning and fundamentally enhancing the intrinsic safety level of energy storage systems.

1:1:1Monitoring
Voltage / Temperature / Pressure Relief Valve Status



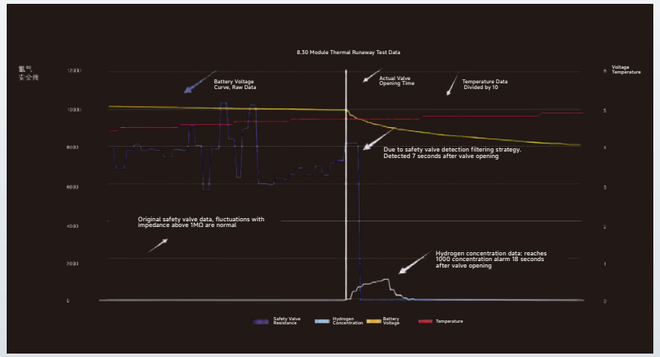






Experimental Data

280Ah Cell-C2 Simultaneously Monitors Battery Voltage, Busbar Temperature, Safety Valve Status, and Hydrogen Gas Concentration. In actual battery overcharge until the battery safety valve opens, the safety valve ejects a gas-liquid mixture, and the safety valve sensor instantly detects the resistance change.



PACK Level 11s Early Perception

Cabin Level 30min Early Perception

omprehensive Safety Testing

20+ Patents Filed Domestically and Internationally

9 Invention

9 Utility Model


Cell Testing


PACK+RACK Testing


Lifecycle Testing


System Testing

Invention 202211635928.4 A Battery Safety Valve and Temperature Detection Circuit; Utility Model 202221219867.2 A Monitoring Device for Lithium Battery Safety Valve;
Invention 202211634582.X A Device for Detecting Leakage in Metal-shell Batteries; Invention 202510097912.4 A Temperature Sensor and Manufacturing Method; Utility Model 202223411534.2 A Detection Device Integrating Battery Temperature and Safety Valve Detection

BMS + Data Service

Based on microgrid data aggregation, AI data analysis, data prediction, and system control, providing safe, reliable, stable, and economically operated O&M and operational services for the grid and users

Full-Chain Data Service

Aggregation - Prediction - Diagnostic - Trading - Settlement

3000+

Connected Users

Virtual Power Plant & Electricity Sales Dual Qualifications

Open Platform Cloud-to-Cloud Interoperability

Full-Scenario Access

Energy Storage, Distributed Photovoltaics, Charging Piles, Campus Load

GOLD Microgrid EMS
Device-Level Monitoring & System-Level Optimization

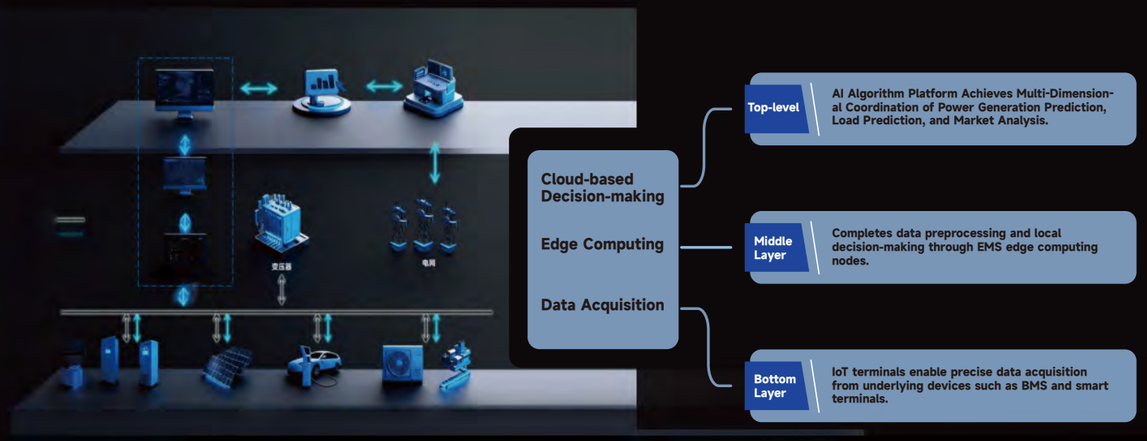
As one of the few domestic enterprises mastering both BMS core technology and EMS platform capabilities, GOLD has pioneered a new management model of "Device-Level Monitoring + System-Level Optimization"

Energy Management System EMS
Single-unit, multi-unit parallel, and multi-transformer chain group control; Supports functions such as peak shaving and valley filling, demand/backflow control, power limit protection, PV-storage coordination, and reactive power compensation.

Edge Diagnostics
Diagnosis of Individual Device/System Operation Status, Battery System Safety Diagnosis, Cloud-Edge Coordination, Local Storage

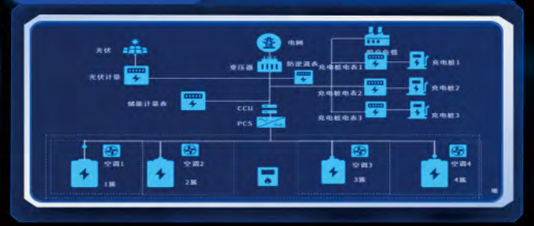
High-end Hardware
Integrates BMS, EMS, Communication Management Unit Functions, Multiple DIDO and Communication Interfaces

Data Aggregation
Flexible Access for Multiple Devices and Protocols in Energy Storage Systems



Multi-Unit, Multi-Level Parallel Connection Scenario

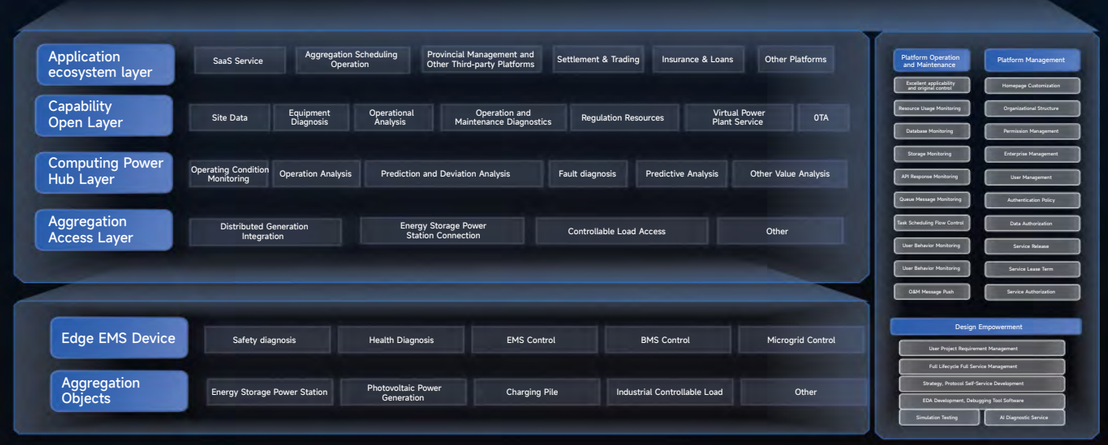
PV-Storage-Charging Microgrid Scenario



GOLD Data Service Platform

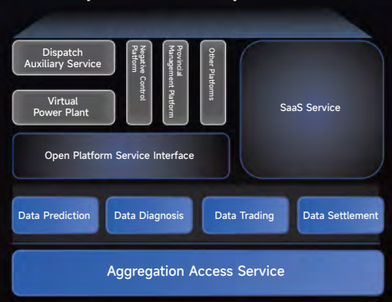
GOLD uses the data service platform as its digital foundation, achieving deep integration of industrial chain resources and capabilities through an open platform architecture, realizing the ecological win-win of "data aggregation, unlimited services".

GOLD Data Service Platform



Architecture Topology

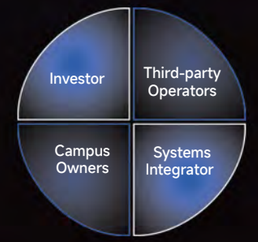
Open to enterprises



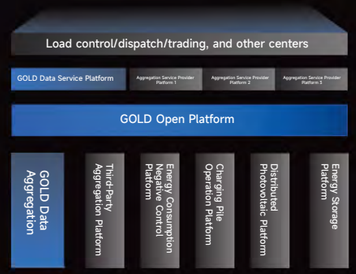
GOLD Data Service Business Topolog

GOLD Open Platform

Resource Sharing, Collaborative Operation



Platform-Oriented Openness



GOLD Operation Service

As the construction of the national unified electricity market accelerates comprehensively, GOLD is deepening its layout in three major business directions:

1 Virtual Power Plant Aggregation Operation

2 Electricity Market Spot Trading

3 Zero-Carbon Park Solution

GOLD Smart Microgrid + Virtual Power Plant

1GW+
Connects to adjustable resources

100MW+
Total Regulation Resources

98.7%
Adjustment Qualification Rate

Relying on Zhejiang experience, the company is expanding into markets such as Guangdong, Anhui, Shandong, etc., building a cross-regional collaborative landscape.

GOLD Solution: Zero-Cost Electricity Sales Transformation Solution

AI Large Model Driven

Integrates time-series forecasting, meteorological large models, and trading strategies

92%+
Load Forecasting

93%+
Electricity Price Prediction

65%+
Price Spread Direction

① Virtual Power Plant Access and Operation

Free access to GOLD Virtual Power Plant to participate in grid demand response and frequency regulation ancillary services, obtaining stable policy subsidies + market-based revenue, creating new profit growth points.

② New Energy Investment Profit Sharing

Leveraging GOLD's energy asset investment capabilities, connecting with high-quality PV, energy storage, and microgrid project resources from electricity retailers, participating in investments and sharing in project profit distributions.

③ Storage-Sale Linkage Arbitrage

Customizes dedicated optimization strategies for energy storage operation, achieving coordinated operation of electricity sales business and energy storage assets, improving asset utilization.

Real-time Data + AI Intelligent Decision-Making = Precise Trading + Diversified Revenue

Bid Farewell to Experience-Driven, Embrace Data-Driven + Intelligent Decision-Making, Relying on Professional Tools to Achieve Precise Trading, Controllable Risks, and Diversified Profits!

Zero-Carbon Park Solution

Zero-Carbon Consulting and Planning | Green Comprehensive Energy and Carbon | Source-Grid-Load-Storage -Charging Construction | Operational Services

GOLD Operation and Maintenance Service

Three Major Management Challenges for Energy Storage Clusters

Difficult Monitoring Coverage
Consistency Deviation of Tens of Thousands of Battery Cells Exceeds 30% No Full Individual Cell Monitoring Capability

Difficult Fault Identification
Massive Dynamic Correlated Data Manual/Simple Algorithms Cannot Timely Identify Precursors

Difficulty in Responding to Warnings
Weak Precursor Signals for Faults (0.3°C/h temperature rise, tens of millivolts voltage deviation) Missed Detection Greatly Compresses Emergency Response Time

Online Operations and Maintenance
Remote Intelligent Monitoring and Digital Management
Real-time data monitoring, intelligent fault diagnosis and early warning, remote dispatch and control

Offline Maintenance
On-site regular inspection + fault emergency repair; Specialized maintenance + on-site support

One-Stop Implementation
Periodic Inspection + Emergency Repair + Maintenance Full Process Coverage

Rapid Emergency Repair
Rapid On-site Response, Minimizing Downtime Loss, Efficient Restoration

Professional Safeguarding
Precise Battery Detection + Deep Maintenance Extends Equipment Full Lifecycle

Safety Net
Safety Net Full-process risk control, eliminating station safety hazards from the source

Digital-Intelligence Closed Loop
Loop On-site Data Synchronized Online, Maintenance Fully Traceable and Verifiable

Customized Service
Tailored to Actual Site Requirements, Solutions Flexible and Adaptable

The GOLD project team constructed a digital twin and intelligent early warning system for the entire battery lifecycle, achieving refined management through a three-tier architecture:

Perception Layer
Deployed Multiple Types of Sensors for 12k+ Cells Achieves millisecond-level full-domain data acquisition

Analysis Layer
Three Engines Enable 15-Minute Advanced Risk Warning Battery State of Health error within ±3%, accurately locating weak batteries

Perception Layer
Supports automatic generation of maintenance work orders and 1:1 three-dimensional visual management
Full Lifecycle Digital Archive, Drives Smart Operation and Maintenance

Full-stack Solutions for Commercial and Industrial Energy Storage

Joint R&D / Operations and Maintenance Hosting / Revenue Guarantee

High Security

GOLD New Generation

G2.BMS

Voltage • Temperature • Safety Valve Status

1:1:1 Detection

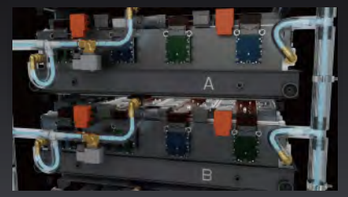
Cell/Cluster/Cabinet

Triple Fire Protection Linkage

Cell-Level Point-to-Point Spraying

Cluster-level Firefighting Chemical Agent

Cabinet-Level Water Mist



Scientific Zoning and Isolation Design

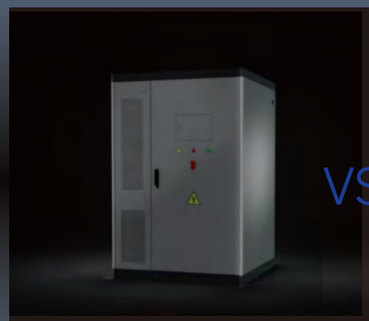
IP67 Level Sealing

High Position of Electrical Compartment

Battery Container Centered

Temperature Control Chamber Low Position

Low Cost



VS

R&D Investment

Saves Tens of Millions

Cabinet Volume

Save 30%

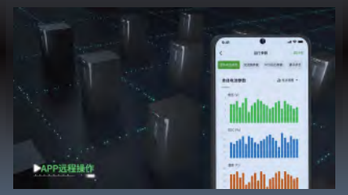
Overall Cost

Saves 5-8%

Ultra-Intelligent

Visual Indicator Panel ESPID

APP Remote Operation



Data Service Operation Platform

Peace of Mind

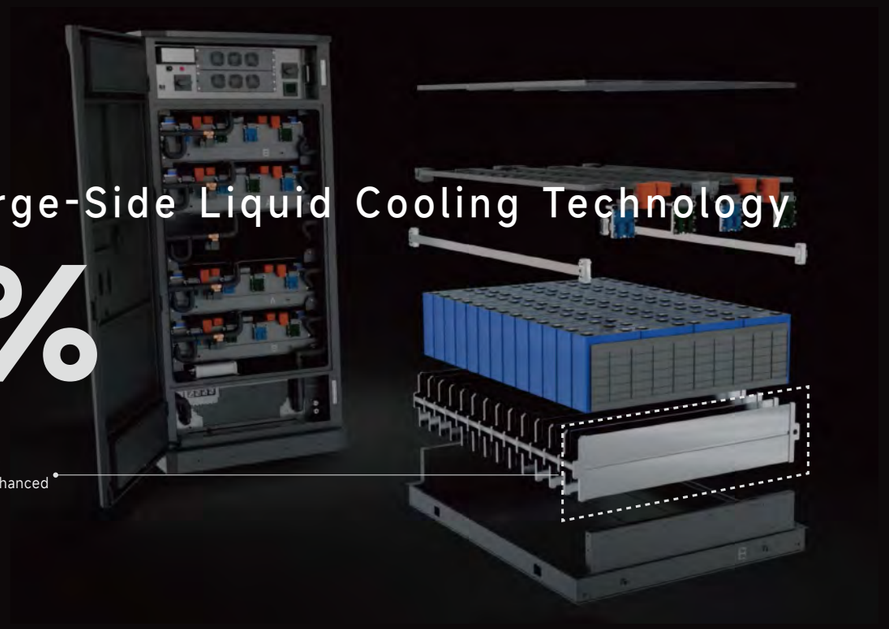
5s Integrated Architecture, Plug-and-Play

Cost Savings

Multi-dimensional Cost Reduction in Development, Hardware, and Operations

Saves Space

Footprint < 1.3 m^2 Volume < 3 m^3



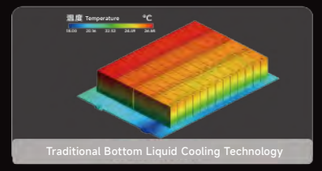
GOLD Large-Side Liquid Cooling Technology

70%

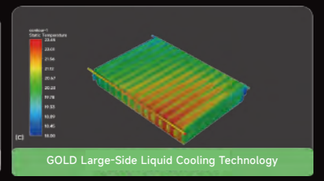
Bilateral High-Efficiency Heat Dissipation Coverage Area Enhanced

GOLD Large-Side Liquid Cooling Technology

Blocks Thermal Propagation



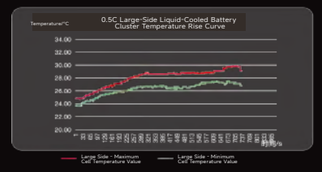
Traditional Bottom Liquid Cooling Technology

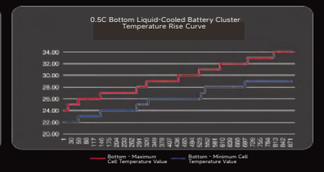


GOLD Large-Side Liquid Cooling Technology

<2.6°C

Intelligent Flow Distribution, Temperature Difference





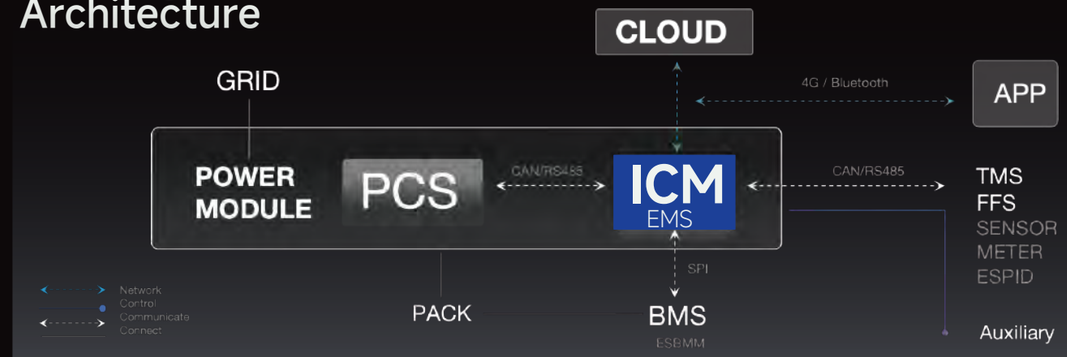
【Innovative Design】

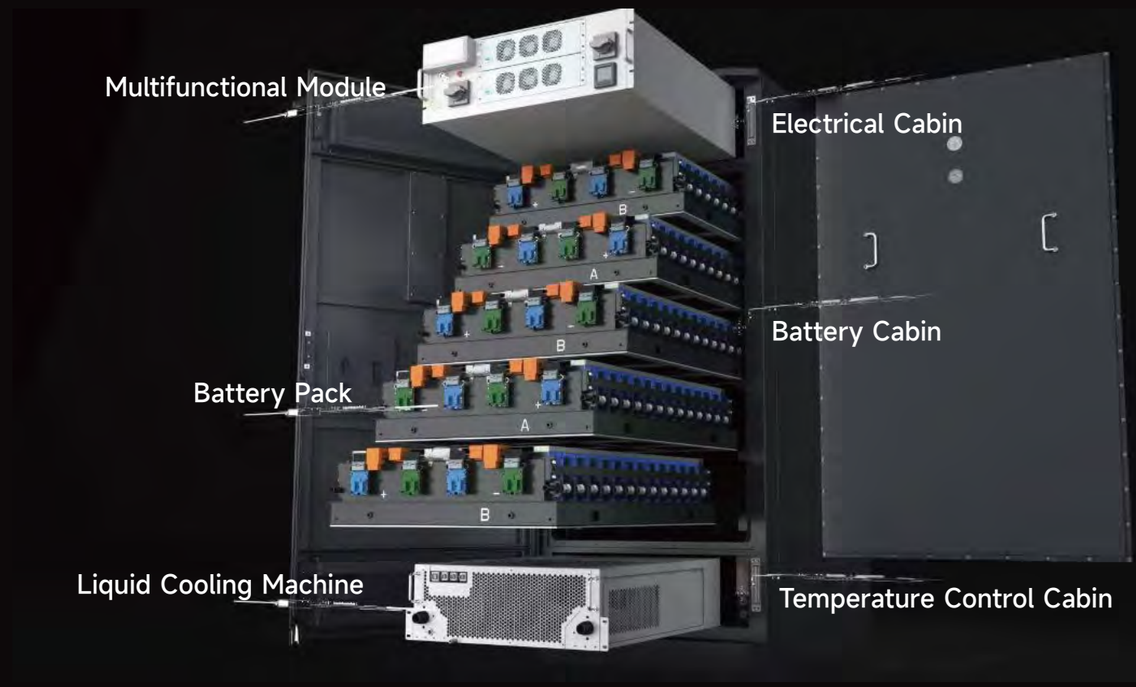
Multifunctional Module

High-Voltage Box + ICM + PCS + Distribution Box

5S Integrated Architecture

BMS/EMS/PCS/TMS/FFS





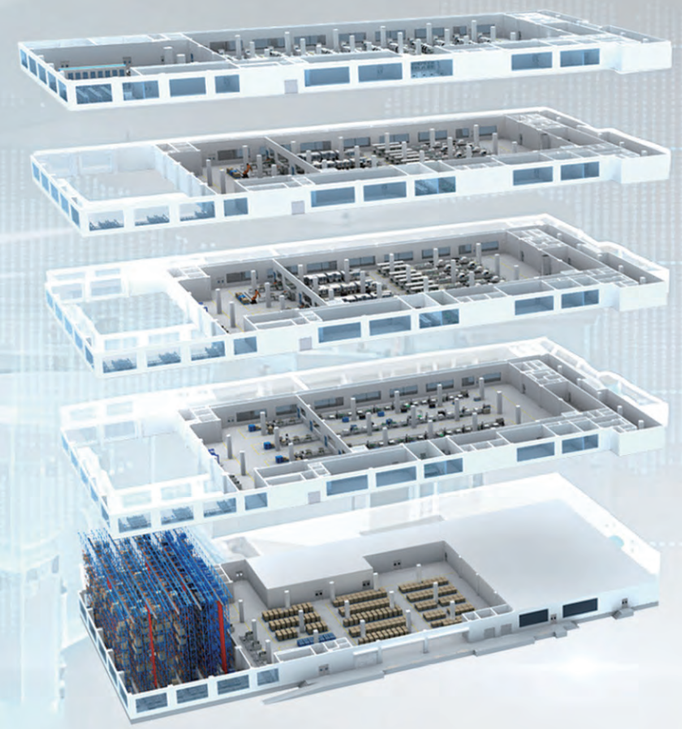
Production Capability

GOLD Intelligent Manufacturing Factory

The GOLD Smart Park, with intelligence, digitalization, and efficient collaboration at its core, has created a modern industrial ecosystem integrating production manufacturing, quality control, and smart logistics.

The smart production line builds a full-process digital control system from SMT to logistics, achieving 100% visual production processes and 100% traceable data. SMT integrates AOI/SPI online inspection, combined with intelligent spraying processes in a constant temperature and humidity environment, to intercept defects in real-time and ensure coating quality. Simultaneously, through WMS+AGV intelligent scheduling and fully automated packaging lines, an end-to-end efficient logistics closed loop is constructed.

The entire park deeply integrates digital technology throughout the entire chain, ensuring stable and reliable product quality while achieving comprehensive upgrades in production efficiency and operational management. It serves as the core capacity support for GOLD ' deep cultivation in the energy storage and BMS fields.



±0.1 mm
Detection Accuracy

7000 pcs
Single-Shift Production Capacity

Full Process
Digital Production Management System



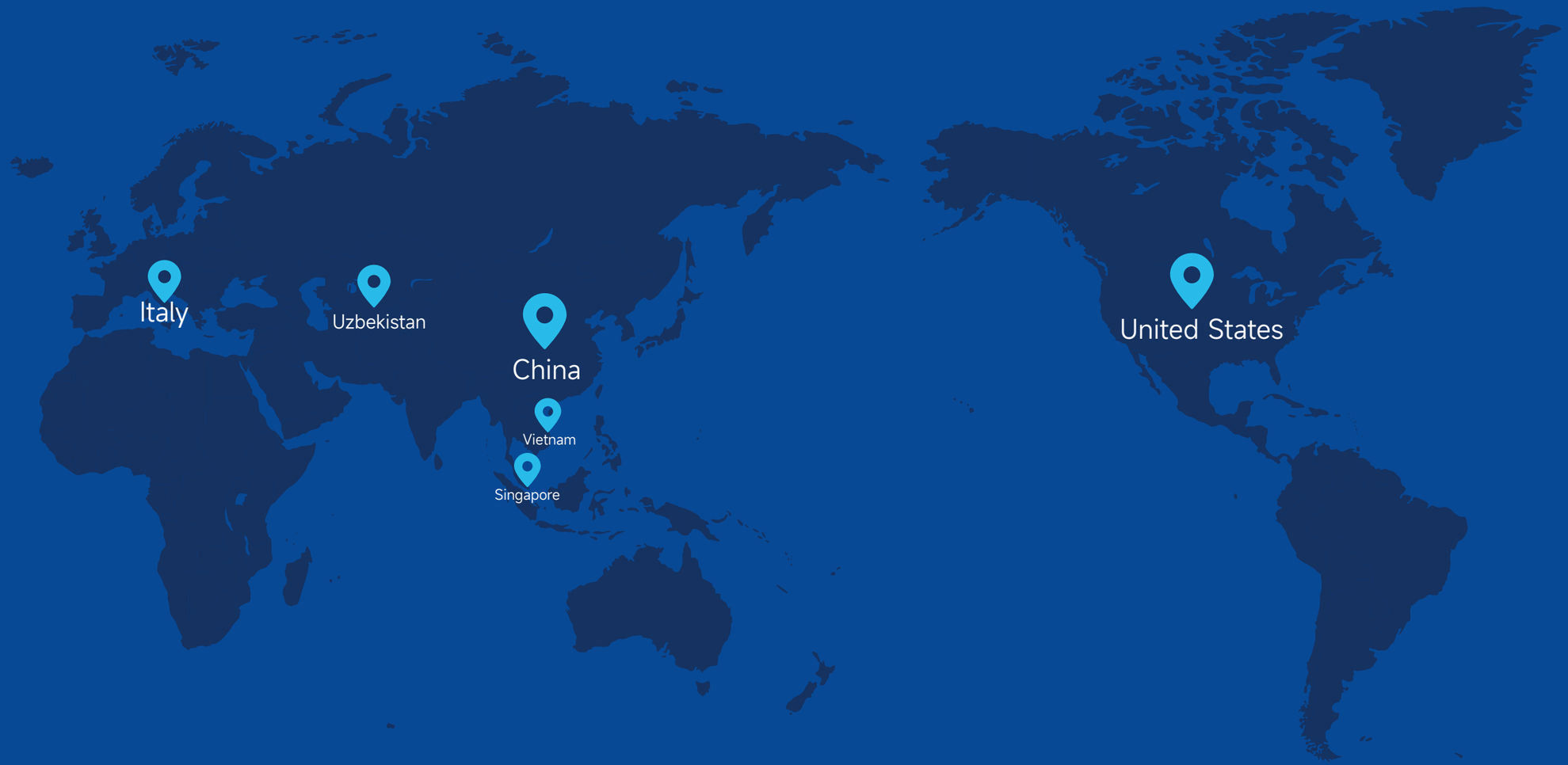
GOLD Intelligent Manufacturing Sets a New Benchmark in the BMS Industry

Global Service Network

10000+
Project Cases

500+
Global Customers

30+
Countries with Business Reach



Global Coverage

Deployed in core regions across Asia, Europe, and North America, establishing a multi-point, interconnected service station network.

Rapid Response

Localized service centers + professional technical teams significantly shorten problem response and resolution times.

Full Lifecycle Support

Provides one-stop service from technical consultation and customized solutions to on-site commissioning and after-sales maintenance, covering the entire product lifecycle.

More Comprehensive Compliance Support

Possesses global mainstream certifications such as UL/IEC/CE, meeting market access requirements for multiple countries.