



WORLD PRIME SERVICES

BATTERY ENERGY STORAGE SYSTEMS PRODUCT CATALOG

ENGINEERING • INTEGRATION • QUALITY • GLOBAL EXPORT
GLOBAL SOLUTIONS FOR A SUSTAINABLE FUTURE



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01 COMPANY PROFILE

World Prime Services is an international engineering, consulting, commercial representation and global supply company focused on Battery Energy Storage Systems (BESS), power conversion, grid integration and related electrical infrastructure. We support clients from the first technical discussion through supplier selection, engineering coordination, factory inspection, export, commissioning and after-sales support.

Through strategic partnerships with top manufacturers, strict quality assurance and global logistics via Hong Kong, we ensure our clients around the world receive safe, efficient and long-lasting energy storage systems.



OUR ROLE

We act as the client's technical and commercial interface, translating project requirements into a coordinated equipment package, procurement strategy and delivery plan.

GLOBAL DELIVERY MODEL

Solutions are sourced from selected Chinese manufacturers and technology partners and coordinated for international export, including commercial operations through Hong Kong when applicable.

CORE BUSINESS AREAS

- ◆ BESS engineering and consulting
- ◆ Factory inspections and FAT coordination
- ◆ Commercial representation and international sales
- ◆ Export, commissioning and after-sales support

02 EXPERIENCE AND MARKET POSITIONING

Our value is built around multidisciplinary project coordination. The World Prime Services model combines energy engineering, industrial sourcing, international trade, logistics and client-side project management. This allows customers to evaluate several qualified technologies through one coordinated commercial channel while maintaining clear technical requirements, documentation control and accountability.

PROJECT ENVIRONMENTS

- ◆ Commercial and industrial facilities
- ◆ Mining and mineral processing
- ◆ Microgrids and hybrid power systems
- ◆ Utilities and grid-support projects
- ◆ Data centers and critical loads
- ◆ Solar and wind power plants
- ◆ EV charging hubs
- ◆ Remote and weak-grid applications

HOW WE CREATE VALUE

Project Stage	World Prime Services Contribution
Opportunity definition	Load profile review, project objectives, operating mode and preliminary solution concept
Technical development	Energy and power sizing, system architecture, supplier requirements and interface definition
Commercial procurement	Factory comparison, scope alignment, exclusions review and contract support
Production and inspection	Document review, quality plan, FAT coordination and pre-shipment verification
Delivery and operation	Export coordination, commissioning planning, training, warranty and lifecycle support

03 ENGINEERING AND CONSULTING CAPABILITY

World Prime Services provides practical engineering support to align the battery system with the electrical network, operating profile, site conditions and commercial objectives. The scope can range from preliminary advisory work to full technical coordination of a turnkey BESS package.



Engineering Service	Typical Deliverable
Feasibility and load analysis	Demand profile, use-case definition, energy/power ratio and operating strategy
System sizing	MW/MWh rating, duration, cycle profile, reserve margin and augmentation concept
Electrical integration	Single-line concept, PCS selection, transformer/MV interface and protection philosophy
Controls integration	BMS, EMS, SCADA, metering, communications and remote monitoring requirements
Site and installation	Footprint, access, clearances, auxiliaries, environmental limits and installation concept
Commercial and lifecycle review	CAPEX scope, OPEX factors, warranties, availability and degradation assumptions

04 MANUFACTURING PARTNERS AND GLOBAL SUPPLY

World Prime Services represents and cooperates with selected reputable and large Chinese manufacturers of battery cells, modules, racks, outdoor cabinets, liquid-cooled systems, containerized BESS, power conversion equipment and medium-voltage packages. Partner selection is based on product maturity, manufacturing capability, quality systems, test documentation, customization capacity and international project support.

SUPPLY MODEL

- ◆ Multiple qualified factory options
- ◆ Scope and interface alignment
- ◆ OEM/ODM and brand customization
- ◆ FAT and pre-shipment inspection options
- ◆ Technical specification issued before quotation
- ◆ Factory capability and quality review
- ◆ Production follow-up and documentation control
- ◆ Export coordination through China and Hong Kong

INDEPENDENT CLIENT FOCUS

The recommended configuration is selected against the customer's operating requirements rather than a single fixed product. This gives the project access to different cell platforms, PCS technologies, cooling methods, enclosure formats and control architectures while preserving one coordinated technical and commercial interface.

05 COMPLETE PRODUCT PORTFOLIO



Residential



Rack



Outdoor



Container

Product Family	Typical Range	Primary Applications
Residential ESS	5-20 kWh per unit	Solar self-consumption, backup and time-of-use optimization
High-Voltage Rack ESS	50-300 kWh	Commercial facilities, telecom, UPS and indoor BESS rooms
Outdoor Air-Cooled Cabinet	100-500 kWh	Peak shaving, backup, microgrids and renewable integration
Outdoor Liquid-Cooled Cabinet	215 kWh-1 MWh	High-cycle C&I, data centers and high-density sites
Containerized DC Block	2-6.25 MWh class	Utility-scale storage, renewable plants and large microgrids
Integrated AC / MV Block	Project-specific MW/MWh	Turnkey grid-connected and grid-forming projects
PCS and Control Systems	50 kW to multi-MW	Bidirectional conversion, dispatch and plant control

06 BATTERY TECHNOLOGY AND SYSTEM ARCHITECTURE

LITHIUM IRON PHOSPHATE PLATFORM

Most stationary solutions are based on lithium iron phosphate (LiFePO₄) chemistry due to its combination of thermal stability, cycle capability and suitability for daily energy-storage duty. Final cell selection depends on the required power, duration, temperature range, cycle profile, warranty and project certification strategy.

System Layer	Function
Cell and module	Electrochemical energy storage, monitoring points and mechanical containment
Rack or battery cluster	Series/parallel configuration, local BMS, DC protection and service isolation
Battery system controller	State estimation, alarms, interlocks, balancing and coordination with PCS/EMS
PCS	Bidirectional AC/DC conversion, active/reactive power control and grid functions
EMS / SCADA	Dispatch, optimization, site control, historian, alarms and remote access
Thermal and fire systems	Temperature management, detection, ventilation, suppression and emergency response
Transformer / MV interface	Voltage transformation, protection, metering and grid connection

CONFIGURATION OPTIONS

- ◆ Air-cooled or liquid-cooled
- ◆ Grid-following or grid-forming PCS
- ◆ Local EMS or plant-level SCADA
- ◆ DC block or integrated AC system
- ◆ Indoor, outdoor cabinet or container format
- ◆ Project-specific communication protocols

07 RESIDENTIAL ENERGY STORAGE SYSTEMS



Compact residential systems are designed for solar self-consumption, backup power and time-of-use management. Wall-mounted and floor-standing formats can be supplied with low-voltage or high-voltage architectures, compatible communications and modular expansion options.

Model Series	Nominal Energy	Architecture	Typical Features
WPS-R5	5 kWh	Low-voltage	Compact wall/floor unit, smart BMS, local status
WPS-R10	10 kWh	Low or high voltage	Hybrid inverter compatibility and expandable capacity
WPS-R15	15 kWh	Modular	Parallel expansion and higher backup autonomy
WPS-R20	20 kWh	Modular	Large-home and small-commercial duty

Final voltage, dimensions, usable energy, IP rating, communications and warranty are confirmed for the selected partner platform and destination market.

08 COMMERCIAL AND HIGH-VOLTAGE RACK SYSTEMS



High-voltage rack systems provide modular energy capacity for indoor commercial, telecom, UPS and industrial applications. They are configured as one or more battery racks connected to a compatible PCS and coordinated through rack-level and system-level battery management.

Series	Energy Class	Configuration	Application
WPS-RACK-50	50 kWh	Single compact rack	Telecom and small commercial
WPS-RACK-100	100 kWh	High-voltage rack	Commercial and UPS support
WPS-RACK-200	200 kWh	Multi-rack system	Industrial demand management
WPS-RACK-300	300 kWh	Multi-rack system	Microgrid and hybrid generation

Typical integration includes rack-level BMS, master controller, DC protection, CAN/RS485/Ethernet communications and scalable parallel rack configuration.

09 OUTDOOR CABINET ENERGY STORAGE SYSTEMS



Outdoor cabinets combine battery racks, controls, thermal management and safety systems in a weather-protected enclosure. Solutions may be supplied as DC battery cabinets or as integrated AC systems with PCS and distribution equipment.

Series	Energy Class	Typical Power Class	Cooling
WPS-C100	100 kWh	50-100 kW	Air cooled
WPS-C215	215 kWh	100-125 kW	Air or liquid
WPS-C233	233 kWh	100-125 kW	Air or liquid
WPS-C261	261 kWh	125 kW	Liquid option
WPS-C372	372 kWh	186-250 kW	Liquid cooled
WPS-C418	418 kWh	200-250 kW	Liquid cooled
WPS-C500	500 kWh	250 kW	Liquid cooled
WPS-C1000	1 MWh class	500 kW class	Integrated outdoor system

10 LIQUID-COOLED ENERGY STORAGE SYSTEMS



Liquid-cooled systems are intended for high-utilization and high-energy-density applications where tighter temperature control is required. The cooling circuit reduces cell-to-cell temperature variation and supports stable operation under demanding ambient and cycling conditions.

Configuration	Typical Range	Key Characteristics
C&I liquid-cooled cabinet	215-500 kWh	Compact footprint, high cycle duty and integrated safety systems
Large outdoor cabinet	500 kWh-1 MWh	Higher energy density and centralized thermal management
Integrated AC block	1-5 MWh class	Battery, PCS, controls and auxiliary systems in coordinated package
Grid-forming package	Project-specific	Weak-grid operation, renewable support and microgrid functionality

Standard subsystems include battery racks, high-voltage box, liquid cooling unit, BMS, HMI/gateway, fire detection and suppression, gas detection, emergency ventilation and EMS/SCADA interface.

11 CONTAINERIZED AND UTILITY-SCALE SYSTEMS



Containerized systems provide scalable multi-MWh building blocks for renewable energy plants, utilities, mining, data centers and large microgrids. Projects can use separate DC battery containers with centralized PCS stations or integrated AC blocks with conversion and medium-voltage interfaces.

Model Class	Nominal Energy	Format	Typical Use
WPS-2M	2 MWh class	20-ft class	Commercial and utility projects
WPS-3M	3 MWh class	20-ft class	Renewable shifting and grid services
WPS-3.44M	3.44 MWh class	20-ft high-density	Utility-scale DC block
WPS-5M	5 MWh class	20-ft liquid cooled	High-density utility projects
WPS-6.25M	6.25 MWh class	High-density block	Large renewable and grid projects

Energy, dimensions and transport configuration are selected according to cell platform, cooling design, certification scope, shipping restrictions and project duty cycle.

12 PCS, EMS, BMS, SCADA AND MV INTEGRATION

A bankable BESS requires coordinated subsystems, clear responsibility boundaries and tested communications. World Prime Services can coordinate the battery platform with power conversion, controls, transformers, switchgear, protection, metering and plant-level supervision.

Subsystem	Scope Options	Main Function
Bidirectional PCS	String or centralized; indoor or outdoor	Active/reactive power conversion, grid support and islanding functions
Battery Management System	Module, rack and system levels	Monitoring, state estimation, balancing, protection and interlocks
Energy Management System	Local controller or plant controller	Scheduling, optimization, SOC management and asset coordination
SCADA and communications	HMI, historian, gateway and remote access	Alarms, trends, reports, cybersecurity interfaces and dispatch integration
Transformer and MV station	Dry-type or oil-filled; skid or container	Voltage transformation, protection, metering and grid interconnection
Auxiliary systems	UPS, HVAC, fire system and lighting	Safe and reliable operation of the complete installation

COMMUNICATION OPTIONS

- ◆ CAN and RS485
- ◆ IEC 61850 where specified
- ◆ Ethernet and fiber-optic networks
- ◆ Modbus TCP/RTU
- ◆ IEC 60870-5-104 or DNP3 where required
- ◆ Remote VPN and plant cybersecurity interfaces

13 APPLICATIONS AND USE CASES

Application	BESS Value
Peak shaving and demand management	Reduces maximum demand and manages contracted capacity
Renewable energy shifting	Stores solar or wind generation for later delivery
Backup and resilience	Maintains critical loads during grid disturbances or outages
Microgrid operation	Coordinates grid, renewable generation, diesel and battery resources
Data centers	Supports reliability, ramp management and integration with UPS/generation
Mining and industry	Reduces fuel consumption, stabilizes weak grids and manages large loads
EV charging hubs	Limits grid demand and supports high-power charging
Grid services	Provides frequency response, voltage support, reserve and capacity services

14 ENGINEERING AND PROJECT DELIVERY PROCESS

A structured delivery process reduces technical gaps between the battery supplier, PCS supplier, EPC contractor, grid operator and end user. World Prime Services adapts the level of support to the project stage and contract structure.

Phase	Key Activities
1. Definition	Objectives, load profile, site conditions, grid parameters, duration and operating strategy
2. Concept engineering	Sizing, architecture, equipment options, footprint and preliminary interfaces
3. Technical procurement	Specification, partner selection, bid normalization and scope clarification
4. Detailed coordination	Drawings, data sheets, communications, protection, auxiliaries and documentation register
5. Manufacturing and FAT	Production follow-up, inspection plan, FAT procedure and punch-list closure
6. Export and delivery	Packing, shipping documents, logistics coordination and receiving requirements
7. Installation and commissioning	Site readiness, SAT support, energization, functional tests and training
8. Lifecycle support	Remote support, preventive maintenance, spare parts and warranty coordination

15 QUALITY ASSURANCE, FAT AND DOCUMENTATION

Quality assurance is managed against the approved technical specification and project documentation list. Inspection scope is agreed before production and can include remote reviews, on-site factory visits and independent third-party inspection.

TYPICAL QUALITY ACTIVITIES

- ◆ Supplier qualification and factory capability review
- ◆ Incoming material and production quality-plan review
- ◆ Insulation, continuity and functional testing
- ◆ Alarm, interlock and emergency-stop verification
- ◆ Component and certification document verification
- ◆ Assembly, wiring and enclosure inspection
- ◆ BMS / PCS / EMS communication checks
- ◆ FAT report, punch list and release for shipment

DOCUMENT PACKAGE

Document Group	Typical Content
Technical	Data sheets, drawings, single-line diagrams, architecture and interface lists
Quality	Inspection plan, test procedures, FAT records and non-conformance closure
Compliance	Certificates, declarations, battery transport test summary and safety documents
Operation	Installation manual, commissioning procedure, O&M manual and spare-parts list

16 EXPORT, LOGISTICS AND DELIVERY

World Prime Services coordinates international trade and export activities for BESS equipment manufactured in China, including commercial routing through Hong Kong where appropriate. The logistics plan is developed around battery classification, container dimensions, destination requirements, Incoterms and project schedule.

Workstream	Support Scope
Commercial and export documents	Quotation, commercial invoice, packing list, certificate support and contractual document coordination
Battery transport documentation	UN 38.3 test summary and applicable dangerous-goods documentation from the selected manufacturer
Packing and handling	Export packing, lifting points, moisture protection, shock indicators and handling instructions
Ocean and multimodal transport	Container planning, port coordination, freight forwarding and delivery interfaces
Destination preparation	Import-document support, unloading plan, storage conditions and site receiving checklist

DELIVERY OPTIONS

- ◆ EXW / FCA factory collection
- ◆ CFR / CIF destination port
- ◆ Consolidated shipment of BESS and electrical equipment
- ◆ FOB China port
- ◆ DAP project location where available
- ◆ Spare-parts and warranty shipment coordination

17 COMMISSIONING, TRAINING AND AFTER-SALES

Technical support continues beyond shipment. Depending on project scope and destination, support can be provided remotely or on site in coordination with the selected manufacturer, local EPC contractor and service partners.

Service	Typical Scope
Installation review	Site readiness, equipment placement, cable routing, auxiliaries and pre-energization checks
Commissioning support	BMS/PCS/EMS configuration, communications, functional tests and operating-mode verification
Performance verification	Capacity, power, efficiency, alarms, dispatch and interface checks
Training	Operator training, emergency procedures, routine inspection and basic troubleshooting
O&M support	Preventive maintenance plan, remote diagnostics, software support and service coordination
Warranty coordination	Failure analysis, spare-parts processing, repair/replacement coordination and documentation

18 COMPLIANCE FRAMEWORK AND PRODUCT SELECTION

Certification and compliance requirements depend on the destination country, installation type, authority having jurisdiction and project contract. The selected partner platform and complete system scope must be reviewed against the applicable codes before purchase.

Reference Area	Typical Standards / Evidence
Industrial battery safety	IEC 62619 and/or IEC 63056 as specified
Stationary battery systems	UL 1973 where North American certification is required
Complete energy storage system	UL 9540 where specified
Thermal event assessment	UL 9540A test information where required by project or authority
Installation and fire code	NFPA 855 and local fire/building requirements where applicable
Lithium battery transport	UN Manual of Tests and Criteria, Section 38.3 documentation
Electrical integration	Applicable IEC, IEEE, utility and local grid-connection requirements

SELECTION INFORMATION REQUIRED

- ◆ Required power (kW or MW)
- ◆ Discharge duration and cycle frequency
- ◆ Ambient temperature, altitude and environment
- ◆ Required communications and operating modes
- ◆ Required usable energy (kWh or MWh)
- ◆ Grid voltage, frequency and short-circuit level
- ◆ Indoor/outdoor and footprint constraints
- ◆ Destination certification and warranty requirements

19 PRODUCT CONFIGURATION MATRIX

The following matrix supports early-stage selection of a suitable World Prime Services BESS configuration. Final equipment, ratings, dimensions and certifications are confirmed after review of the load profile, grid connection, required operating duration, environmental conditions and destination-market requirements.

Solution Family	Typical Energy Range	Power / Duration	Primary Configuration	Typical Use
Residential ESS	5–40 kWh	3–20 kW / 1–4 h	Low-voltage or high-voltage modular battery	Solar self-consumption, backup
High-Voltage Rack ESS	50–500 kWh	30–250 kW / 1–4 h	Indoor racks with external PCS	Commercial, telecom, UPS
Outdoor Cabinet ESS	100 kWh–1 MWh	50 kW–500 kW / 1–4 h	Integrated or DC battery cabinet	C&I, microgrid, EV charging
Liquid-Cooled ESS	215 kWh–7+ MWh	100 kW–3+ MW / 2–8 h	High-density liquid-cooled blocks	High utilization, data centers
Containerized ESS	2–9+ MWh per unit	1–5+ MW / 2–8 h	20 ft / 40 ft DC or AC block	Utility, renewable plants, mining

SELECTION LOGIC

- Energy capacity is determined from usable-load demand and discharge duration.
- Power rating is determined from peak demand, ramp rate, grid-service duty and overload requirements.
- Cooling, ingress protection, fire strategy and enclosure architecture are selected for the installation environment.
- Compliance is confirmed against the project contract and authority having jurisdiction.

20 RESIDENTIAL AND SMALL COMMERCIAL PRODUCT DETAILS

RESIDENTIAL BATTERY SYSTEMS

Safe, reliable and compact energy storage solutions
for modern homes.



World Prime Services residential product family — full-product studio presentation

Residential and small commercial platforms are supplied in wall-mounted, floor-standing and modular stack configurations. LiFePO₄ chemistry, intelligent BMS, inverter communications and configurable backup operation support solar self-consumption, time-of-use management and resilient power.

Model Class	Nominal Energy	Voltage Platform	Scalability	Installation
WPS-R5	5 kWh	48–51.2 V	Parallel expansion	Wall / floor
WPS-R10	10 kWh	48–51.2 V or HV	Modular expansion	Wall / floor
WPS-R15	15 kWh	HV modular	Stack or parallel	Floor
WPS-R20	20 kWh	HV modular	Multi-module	Floor

STANDARD FUNCTIONAL SCOPE

- Battery modules with integrated BMS and inverter communications
- SOC, SOH, voltage and temperature monitoring
- Electrical and thermal protection functions
- Optional mobile or web monitoring through the selected inverter platform

21 HIGH-VOLTAGE RACK AND OUTDOOR CABINET DETAILS

High-voltage racks and outdoor cabinets provide scalable building blocks for commercial and industrial projects. Systems may be supplied as battery-only DC equipment or as integrated AC solutions with PCS, EMS, auxiliary power, thermal management and fire protection.

Series	Energy Class	Cooling	Protection	Integration
WPS-RACK	50–500 kWh	Air / room HVAC	Indoor cabinet	External PCS
WPS-C100	100 kWh	Air cooled	IP54 / IP55 option	Battery or all-in-one
WPS-C215 / C233	215–233 kWh	Air or liquid cooled	IP54 / IP55	Integrated C&I
WPS-C372 / C418	372–418 kWh	Liquid cooled option	IP55	High-density C&I

INTEGRATED CABINET OPTIONS

- Optional bidirectional PCS and AC distribution
- Rack-level and system-level BMS with EMS gateway
- HVAC or liquid-cooling unit
- Fire detection, emergency stop and project-specific suppression

22 LIQUID-COOLED AND CONTAINERIZED SYSTEM DETAILS

Utility and large industrial projects are configured as modular energy blocks. Current market platforms commonly combine high-density LFP batteries, liquid cooling, rack-level controls and either centralized PCS stations or integrated AC-block architecture. The selected configuration is optimized for duration, transport, site footprint, maintenance strategy and grid requirements.

Platform	Energy Class	Typical Container	Cooling	Architecture
WPS-LC-215	215–261 kWh	Outdoor cabinet	Liquid	C&I all-in-one
WPS-LC-500	372–500 kWh	Outdoor cabinet	Liquid	DC / AC cabinet
WPS-CONT-2M	2–3 MWh	20 ft class	Liquid	DC block
WPS-CONT-5M	5–7+ MWh	20 ft class	Liquid	DC or AC block

PROJECT CONFIGURATION VARIABLES

- Two-hour to longer-duration designs
- 1,000 V or 1,500 V DC architecture, subject to platform
- Centralized PCS, string PCS or integrated AC block
- Grid-following or grid-forming controls where supported

23 PCS, TRANSFORMER AND MEDIUM-VOLTAGE BLOCKS

The power conversion and grid-connection package is selected as a coordinated electrical system. World Prime Services can align the battery operating window, PCS DC range, transformer ratio, switchgear ratings, protection philosophy, auxiliary supply and plant-controller interface.

Subsystem	Typical Range	Key Selection Parameters	Optional Scope
Bidirectional PCS	30 kW–5+ MW	DC voltage, overload, THD, efficiency, grid code	Grid-forming, black start
LV Transformer	0.4–0.8 kV	PCS output, vector group, losses, impedance	Dry type / oil immersed
MV Transformer	6–35 kV typical	Utility voltage, grounding, insulation level	Skid or container station
MV Switchgear / PPC	Project specific	Protection, metering, dispatch and interlocks	RMU, metal-clad, plant control

ELECTRICAL ENGINEERING DELIVERABLES

- Single-line diagram and equipment responsibility matrix
- Cable, protection and transformer coordination inputs
- Switchgear technical specification
- Communication point list and grid-control interface

Packages can be quoted as battery-only, battery plus PCS, low-voltage AC block or medium-voltage block. Installation and local approval scope are defined in the project offer.

24 EMS, SCADA, COMMUNICATIONS AND CYBERSECURITY

The control architecture coordinates the battery, PCS, auxiliary systems and site-level operating strategy. A clear hierarchy prevents conflicting commands and establishes responsibility for dispatch, protection, alarms, historical data and remote service access.

Layer	Primary Function	Typical Interfaces	Typical Data
Battery BMS	Cell and rack protection	CAN, RS485, Ethernet	Voltage, temperature, SOC, SOH
System Controller	Cabinet / container coordination	Modbus TCP, IEC protocols	Limits, alarms, availability
EMS	Economic and operational dispatch	Modbus, OPC UA, API	Schedules, setpoints, forecasts
SCADA	Plant supervision and historian	IEC 61850, IEC 60870-5-104, DNP3	Events, trends, reports

CYBERSECURITY PRINCIPLES

- Role-based access and unique credentials
- Network segmentation and controlled remote access
- Event logging, time synchronization and firmware governance
- Project-specific protocol and cybersecurity requirements

OPERATIONAL FUNCTIONS

- Peak shaving, load shifting and energy arbitrage
- Renewable smoothing and microgrid control
- Backup and islanding operation
- Frequency, voltage and dispatch services where permitted

25 TECHNICAL DATA REQUIRED FOR QUOTATION

Accurate project data allows the engineering team and selected manufacturing partners to provide a technically aligned quotation, avoid unnecessary oversizing and identify local compliance requirements before production.

Information Group	Required Input
Site and Country	Installation address, altitude, ambient temperature, humidity, corrosion category and seismic data
Electrical Network	Grid voltage, frequency, short-circuit level, grounding method, point of connection and grid-code requirements
Operating Profile	15-minute or hourly load data, peak demand, renewable generation profile and critical loads
Performance	Required power, usable energy, duration, cycles per day, SOC window, response time and availability
Commercial / Compliance	Delivery term, schedule, warranty, installation scope, certification, fire code and utility requirements

PREFERRED SUPPORTING DOCUMENTS

- Electricity bills, tariff and interval load data
- Site single-line diagram and transformer information
- Renewable generation profile, when applicable
- Site layout, footprint and access limitations
- Utility interconnection and project specification

Where complete information is not yet available, World Prime Services can prepare a preliminary concept and list the assumptions that must be validated before final equipment selection.

26 COMMERCIAL SUPPLY SCOPE AND OPTIONAL SERVICES

World Prime Services structures the commercial offer around the customer's preferred contracting model. The proposal identifies the included equipment, engineering deliverables, tests, documentation, logistics, field services, warranty responsibilities and exclusions.

Scope Module	Base Supply	Optional Services
Equipment	Battery system and agreed accessories	PCS, transformer, MV station, spares
Engineering	Technical coordination and approved data sheets	Studies, detailed design review, interface management
Quality	Routine tests and supplier documentation	Factory audit, third-party inspection, witnessed FAT
Logistics	Export packing and commercial documents	Freight, insurance, customs support, site delivery
Site Services	Remote technical support	Installation supervision, SAT, commissioning, training

COMMERCIAL MODEL

- Direct equipment export from China through the agreed commercial route
- OEM or ODM branding subject to factory and certification scope
- Incoterms and payment structure adapted to the project
- Manufacturer and component list confirmed in the approved offer

PROPOSAL VALIDITY

All technical values in this continuation are reference classes for project development. Binding ratings, dimensions, certification status, delivery schedule, warranty and commercial terms are established only in the project-specific quotation and approved contract documents.

27 DESIGN BASIS AND PROJECT INPUTS

Every BESS project begins with a documented design basis that converts commercial objectives into measurable technical requirements. World Prime Services coordinates customer data, utility requirements and selected manufacturing platforms to establish the operating envelope before equipment is released for production.

Design Area	Minimum Definition	Engineering Output
Duty and Use Case	Operating mode, dispatch objective, cycles per day, response time	Functional requirements and control philosophy
Power and Energy	Rated power, usable energy, duration, overload and auxiliary demand	Battery and PCS configuration
Site Conditions	Temperature, altitude, humidity, corrosion, dust, seismic and access	Enclosure, cooling and derating basis
Grid Interface	Voltage, frequency, short-circuit level, grounding and utility rules	Transformer, switchgear and protection concept
Commercial Requirements	Schedule, warranty, availability, logistics and service scope	Project execution and supply responsibility matrix

DESIGN FREEZE REQUIREMENTS

- Approved single-line concept and point of connection
- Confirmed operating profile and usable-energy definition
- Agreed environmental and site-layout assumptions
- Applicable codes, standards and authority requirements
- Approved equipment responsibility and interface matrix

Changes after design freeze are managed through a formal technical and commercial change process to protect schedule, quality and system compatibility.

28 BESS SIZING AND PERFORMANCE METHODOLOGY

System sizing is based on usable delivered energy rather than nameplate capacity alone. The engineering calculation considers depth of discharge, conversion losses, auxiliary consumption, temperature effects, degradation, operating reserve and the required performance at the defined warranty point.

Sizing Element	Engineering Consideration	Typical Result
Load Requirement	Critical load, peak demand or dispatch setpoint	Required AC power
Discharge Duration	Energy required at the point of connection	Usable AC energy
Efficiency Chain	Battery, PCS, transformer and cable losses	DC energy requirement
Operating Window	SOC limits, reserve and emergency margin	Installed energy capacity
Degradation Allowance	Calendar aging, cycling and temperature	Beginning-of-life oversizing
Availability Strategy	Redundancy, maintenance blocks and spare capacity	Number of parallel blocks

PERFORMANCE PARAMETERS

- Rated power and allowable overload duration
- Usable energy at commissioning and at the warranty reference point
- Round-trip efficiency and auxiliary-energy boundary
- Response time, ramp rate and control accuracy
- Availability, capacity retention and operating-temperature limits

Final values are confirmed in the project-specific technical agreement and manufacturer performance guarantee. Reference catalog values do not replace the approved project calculation.

29 ELECTRICAL ARCHITECTURE AND GRID INTEGRATION

The electrical architecture is selected to match project scale, maintainability and the point-of-connection requirements. The solution may be configured as a DC battery block, an integrated low-voltage AC block or a complete medium-voltage power station.

1 BATTERY BLOCK	2 DC PROTECTION	3 BIDIRECTIONAL PCS	4 LV/MV TRANSFORMER	5 SWITCHGEAR & METERING	6 GRID / LOAD
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ARCHITECTURE OPTIONS

Configuration	Main Characteristics	Typical Application
DC-Coupled	Battery connected to a common DC bus with renewable generation	Solar plus storage and optimized DC utilization
AC-Coupled	Independent battery PCS connected to the AC system	Retrofit, grid services and flexible operation
Centralized PCS	Large power blocks with shared conversion equipment	Utility-scale and high-power applications
Integrated MV Block	Battery, PCS, transformer and switchgear coordinated as one package	Fast site deployment and standardized plants

GRID-INTERFACE FUNCTIONS

- Active and reactive power control
- Voltage and frequency ride-through where required
- Power-factor and voltage regulation
- Export limitation and plant-level dispatch
- Grid-forming or islanding capability when specified and supported

30 PROTECTION AND SAFETY PHILOSOPHY

Safety is implemented through independent layers that detect abnormal conditions, limit propagation and place the system in a controlled state. The final protection philosophy is coordinated with the selected battery, PCS, fire system, switchgear and local emergency-response requirements.

Protection Layer	Examples of Functions	Typical Action
Cell / Module	Voltage, temperature and current supervision	Alarm, current limit or module isolation
Rack / Battery System	Insulation monitoring, contactor control, fuse and HV interlock	Rack shutdown and DC isolation
PCS / AC System	Overcurrent, over/undervoltage, frequency and anti-islanding	Converter trip and AC isolation
Thermal / Gas Detection	Smoke, heat, off-gas and cooling-system monitoring	Alarm, ventilation response and shutdown
Site Protection	Transformer differential, feeder protection, arc and earth-fault functions	Selective plant isolation

STANDARDS AND PROJECT COMPLIANCE

Design and verification may reference IEC 62619, IEC 62933-5-1, IEC 62933-5-2, UL 9540, UL 9540A, NFPA 855, IEEE 1547 and applicable local requirements. The binding compliance list is project-specific.

- Hazard identification and risk assessment
- Electrical selectivity and isolation coordination
- Thermal-runaway detection and propagation controls
- Emergency response, signage and controlled access
- Documented inspection and test requirements

31 THERMAL MANAGEMENT AND FIRE RISK CONTROLS

Thermal management maintains cell temperature within the operating range and reduces temperature variation across the battery population. The cooling design is selected according to power density, ambient conditions, duty cycle, serviceability and project life requirements.

System	Air Cooling	Liquid Cooling
Typical Application	Lower-density indoor or outdoor cabinets	High-density cabinets and containers
Heat Removal	Forced-air circulation and HVAC	Coolant loop, cold plates and chiller
Temperature Uniformity	Dependent on airflow path and filter condition	More controlled rack and cell temperature distribution
Maintenance Focus	Filters, fans, coils and airflow obstruction	Pumps, coolant quality, leak detection and heat exchanger

FIRE-RISK CONTROL HIERARCHY

- Prevent: qualified cells, controlled charging, thermal design and BMS limits
- Detect: temperature, smoke and off-gas monitoring with alarm escalation
- Isolate: rack contactors, DC disconnects and selective electrical protection
- Control: ventilation and project-specific suppression
- Respond: emergency plan and first-responder information

Fire protection is engineered with enclosure volume, ventilation, detection, battery chemistry, test evidence and local emergency requirements.

32 FACTORY QUALITY PLAN AND FAT

Quality assurance begins before assembly through supplier qualification, approved drawings, component traceability and inspection planning. World Prime Services can coordinate factory surveillance and witnessed testing according to the agreed inspection and test plan.

1	2	3	4	5	6
SUPPLIER APPROVAL	DESIGN REVIEW	INCOMING INSPECTION	ASSEMBLY CONTROL	FACTORY TEST	RELEASE FOR SHIPMENT

Inspection Stage	Representative Checks	Documented Record
Incoming Materials	Cell/module identification, certificates, enclosure and electrical components	Receiving inspection and traceability records
Assembly	Torque, wiring, polarity, insulation, cooling and labeling	Production checklist and nonconformance log
Functional Test	BMS communication, alarms, interlocks, contactors, HVAC and emergency stop	Factory functional-test report
Electrical Test	Insulation resistance, dielectric tests where applicable and protection checks	Electrical test certificate
Integrated FAT	Charging/discharging, PCS control, EMS interface and simulated faults	Approved FAT protocol and signed report

OPTIONAL QUALITY SERVICES

- Independent third-party inspection
- Customer or consultant FAT attendance
- Photo production records
- Pre-shipment document review
- Container loading verification

33 SITE INSTALLATION, SAT AND COMMISSIONING

Site execution is coordinated through defined installation prerequisites and hold points. Equipment energization begins only after civil, mechanical, electrical, communication and safety checks have been completed and accepted.

Phase	Principal Activities	Acceptance Evidence
Pre-Installation	Foundation, access, lifting plan, grounding, cable routes and auxiliary supply	Site-readiness checklist
Electrical Installation	DC/AC/MV terminations, torque, polarity, grounding and insulation checks	Electrical completion certificate
Communication	BMS, PCS, EMS, SCADA, time synchronization and remote-access validation	Point-to-point and communication report
SAT	Interlocks, alarms, protection, emergency stop and operating sequences	Signed SAT protocol
Commissioning	Controlled energization, charge/discharge test and dispatch verification	Commissioning and performance report

COMMISSIONING DELIVERABLES

- Approved redline drawings and equipment settings
- Alarm and protection verification records
- Initial SOC balancing and baseline
- Operator training and emergency procedures
- Punch-list closure and handover

Local contractors, utility representatives and authorities remain responsible for activities assigned by law, permit or contract. Service boundaries are stated in the project offer.

34 OPERATION, MAINTENANCE AND LIFECYCLE SERVICES

Lifecycle performance depends on controlled operation, environmental management, software discipline and preventive maintenance. World Prime Services can coordinate remote support, spare parts, technical service and manufacturer escalation throughout the agreed warranty period.

Service Area	Routine Scope	Lifecycle Objective
Remote Monitoring	SOC, SOH, alarms, temperatures, availability and event review	Early detection and operating optimization
Preventive Maintenance	Visual inspection, filters, cooling system, torque, protection and emergency devices	Reduce unplanned outages
Battery Health	Capacity trends, imbalance, resistance and degradation review	Maintain usable energy and detect abnormal aging
Software and Controls	Approved firmware, backups, user access and parameter governance	Stable and secure operation
Spare Parts	Critical spares, consumables and replacement-module strategy	Shorten recovery time

RECOMMENDED MAINTENANCE FRAMEWORK

- Daily or continuous automated monitoring
- Monthly alarm and performance review
- Periodic site inspection according to duty and environment
- Annual protection and cooling-system verification
- Capacity testing according to the service agreement

END-OF-LIFE PLANNING

Lifecycle planning may include augmentation, repowering, module replacement and compliant recycling. Responsibilities are defined by local requirements and the supply contract.

35 APPLICATION ENGINEERING AND USE-CASE SELECTION

The technical value of a BESS depends on matching the equipment configuration, control strategy and commercial objective to the actual operating profile. World Prime Services develops the application basis from measured load data, generation forecasts, tariff structure, grid restrictions and required resilience level.

Application Objective	Principal Engineering Inputs	Typical Design Output
Peak Shaving	Interval demand profile, demand tariff, maximum import limit	PCS power, usable energy and dispatch threshold
Energy Arbitrage	Time-of-use prices, cycling window and efficiency boundary	Charge/discharge schedule and economic cycle limit
Backup Power	Critical-load list, autonomy time and transfer philosophy	Island capacity, reserve SOC and switchgear concept
Renewable Integration	Solar/wind profile, curtailment and interconnection limits	Firming, ramp control and export-limitation logic
Grid Services	Response time, accuracy, telemetry and market rules	Control functions, reserve allocation and compliance test plan

APPLICATION SELECTION PRINCIPLES

- Separate guaranteed functions from optional operating modes
- Define the metering point for energy and efficiency guarantees
- Confirm simultaneous-service priorities and SOC reserve rules
- Evaluate annual cycling, degradation and augmentation requirements
- Validate utility and market participation requirements before design freeze

36 SOLAR, WIND AND HYBRID POWER APPLICATIONS

Energy storage improves the controllability of variable renewable generation by shifting energy, limiting export, smoothing ramps and supporting dispatch commitments. The final architecture may be AC-coupled, DC-coupled or configured as a hybrid power station with plant-level control.

Renewable Application	BESS Function	Key Integration Requirement
Solar Energy Shifting	Store midday production and discharge during higher-value periods	Forecasting, clipping analysis and charge-window control
Solar Export Limitation	Maintain grid export below a contractual threshold	Fast plant controller and reliable point-of-connection metering
Wind Smoothing	Reduce rapid power variation and improve scheduled output	High-response PCS and coordinated turbine/BESS dispatch
Curtailment Recovery	Capture energy that would otherwise be curtailed	Available charging headroom and grid-code compliance
Hybrid Renewable Plant	Coordinate solar, wind, storage and auxiliary generation	Unified EMS/PPC, common telemetry and operating-priority matrix

TYPICAL HYBRID CONTROL SEQUENCE

1 FORECAST & MEASUREMENT	2 PLANT CONTROLLER	3 BESS EMS	4 PCS & BATTERY	5 GRID / LOAD
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- Forecast renewable production and site demand
- Calculate charge/discharge command within equipment limits
- Coordinate active power, reactive power and SOC reserve
- Apply export limits, ramp limits and curtailment recovery
- Record performance at the point of connection

37 INDUSTRIAL, MINING AND DATA CENTER APPLICATIONS

Commercial and industrial facilities require solutions that combine energy-cost reduction with operational continuity. The BESS is engineered around load criticality, power quality, available short-circuit level, site conditions and the customer's operating procedures.

Sector	Typical Requirements	Representative BESS Scope
Manufacturing	Demand reduction, process continuity and renewable self-consumption	Outdoor cabinet or container BESS with facility EMS
Mining	Remote operation, diesel reduction, harsh environment and large motor loads	Ruggedized container BESS, microgrid controller and MV integration
Data Centers	Fast response, high availability, redundancy and controlled backup support	Modular BESS blocks, redundant controls and critical-load interface
Ports and Logistics	Peak demand, electrified equipment and charging coordination	High-power PCS, schedule optimization and load management
Commercial Buildings	Tariff optimization, solar integration and emergency loads	Compact C&I BESS with remote monitoring and building interface

SITE-SPECIFIC ENGINEERING

- Load-step and motor-starting assessment
- Harmonic and power-quality review
- Redundancy and maintenance-bypass philosophy
- Environmental protection, corrosion and dust controls
- Operating procedures, training and emergency-response coordination

38 MICROGRIDS, BACKUP AND CRITICAL POWER

A microgrid BESS must manage transitions between grid-connected and islanded operation while maintaining stable voltage and frequency. The system design coordinates the PCS, generator controls, renewable sources, protection relays, transfer equipment and critical-load priorities.

Operating Mode	Control Objective	Engineering Considerations
Grid-Connected	Optimize energy cost and provide grid support	Import/export limits, tariff logic and utility commands
Transition to Island	Maintain continuity or execute controlled transfer	Protection coordination, transfer time and load shedding
Island Operation	Balance generation, storage and demand	Grid-forming capability, spinning reserve and SOC management
Black Start	Energize the microgrid without an external source	Auxiliary supply, transformer energization and staged load pickup
Grid Resynchronization	Return to utility operation without disturbance	Synchronism check, ramp control and transfer sequence

CRITICAL POWER DESIGN CHECKS

- Define no-break, short-break and noncritical load categories
- Confirm grid-forming compatibility and minimum stable operating conditions
- Model transformer inrush and large load steps
- Provide reserve SOC and generator-starting contingency
- Test islanding, black-start and resynchronization sequences during SAT

39 COMMERCIAL EVALUATION AND FINANCIAL INPUTS

A technically correct BESS proposal must also define the commercial assumptions that influence lifecycle value. World Prime Services structures the evaluation around project duty, electricity economics, degradation, availability, maintenance and the selected supply boundary.

Evaluation Input	Required Information	Commercial Effect
Energy Tariff	Demand charges, time-of-use prices and escalation assumptions	Revenue and savings profile
Operating Duty	Cycles per day, depth of discharge and standby periods	Battery throughput and degradation
Project Life	Evaluation period, replacement strategy and residual value	Lifecycle cost and augmentation planning
Availability	Planned maintenance and unplanned outage assumptions	Guaranteed service level and lost-value exposure
Supply Boundary	Equipment, installation, grid works, taxes and logistics	CAPEX comparison and responsibility allocation

FINANCIAL MODEL OUTPUTS

- Annual energy savings and revenue by use case
- Battery throughput, capacity retention and augmentation schedule
- Operating expenditure and planned maintenance allowance
- Simple payback, discounted cash flow, NPV and IRR when requested
- Sensitivity to electricity prices, cycling, efficiency and project delays

40 PROPOSAL, CONTRACTING AND DELIVERY FRAMEWORK

The proposal process converts the approved technical basis into a controlled commercial offer. Each quotation identifies scope, exclusions, interfaces, schedule, documentation, warranty conditions and acceptance criteria to reduce ambiguity during execution.

Commercial Document	Principal Content	Purpose
Technical Proposal	Configuration, performance, drawings, controls and compliance	Defines the offered solution
Scope Matrix	Supply, installation, civil works, grid connection and customer responsibilities	Clarifies interfaces and exclusions
Commercial Offer	Pricing, validity, payment terms, Incoterm and taxes	Establishes commercial conditions
Project Schedule	Design approvals, production, FAT, shipment, installation and SAT	Creates delivery milestones
Contract Annexes	Warranty, liquidated damages, acceptance and change management	Allocates contractual risk

DELIVERY GOVERNANCE

1 DATA & CLARIFICATION	2 TECHNICAL OFFER	3 COMMERCIAL AGREEMENT	4 DESIGN & PRODUCTION	5 FAT, SHIPMENT & SITE ACCEPTANCE
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- Single controlled clarification register
- Formal design-review and approval milestones
- Documented change-order process
- Manufacturing progress and quality reporting
- Acceptance evidence linked to contractual milestones

41 WARRANTY, SPARE PARTS AND AFTER-SALES SUPPORT

Lifecycle support begins with a clearly defined warranty boundary and service plan. Warranty terms are aligned with the selected manufacturer platform, operating duty, environmental conditions, maintenance obligations and the agreed performance reference point.

Support Element	Typical Scope	Customer Benefit
Product Warranty	Defects in materials and workmanship under agreed conditions	Corrective support and replacement process
Performance Warranty	Capacity retention, efficiency or availability where contracted	Measurable long-term performance commitment
Spare Parts Package	Critical electronic, cooling, protection and communication components	Reduced repair time and inventory planning
Remote Support	Alarm review, diagnostics, software support and operating guidance	Faster troubleshooting and optimized operation
Field Service	Inspection, repair, preventive maintenance and technical supervision	Local restoration and lifecycle reliability

WARRANTY PRESERVATION REQUIREMENTS

- Operate within approved power, SOC, temperature and cycling limits
- Maintain communication, event logs and remote-access records where required
- Complete scheduled preventive maintenance using approved procedures
- Report abnormal events promptly and preserve diagnostic evidence
- Use approved replacement parts, firmware and service personnel

42 PROJECT INFORMATION AND QUOTATION CHECKLIST

Complete project information enables faster selection, accurate pricing and a technically compliant proposal. The following checklist should be completed before final equipment configuration and commercial submission.

Information Category	Minimum Customer Data	Example / Format
Project Location	Country, site coordinates, altitude and environmental conditions	Site data sheet
Power and Energy	Rated MW, usable MWh, duration, overload and reserve requirement	Operating specification
Operating Profile	Load/generation data, cycles, SOC limits and dispatch objective	12-month interval data
Grid Interface	Voltage, frequency, fault level, grounding and utility rules	Single-line diagram and grid code
Site and Logistics	Layout, access, lifting limits, foundations and delivery restrictions	Site drawings and logistics survey
Commercial Requirements	Delivery date, Incoterm, warranty, financing and local scope	Request for quotation

REQUIRED ATTACHMENTS

- Latest single-line diagram and point-of-connection information
- Load and generation profiles in an editable data format
- Available geotechnical, environmental and site-layout information
- Applicable local standards, utility requirements and permit constraints
- Requested supply boundary, project schedule and proposal submission format