Hanging PV Micro-Storage System

Panel-Mounted, Per-Panel Wireless Energy Storage & Optimization for Existing Solar Plants

Overseas Sales Brochure & Product Reference Pack

Retrofit | Telecom Base Stations | Off-Grid / Weak-Grid | C&I Peak-Shaving

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Note: This pack consolidates every source document, diagram, screenshot and site photo supplied; all Chinese content has been translated into English for overseas sales use. Figures marked as case studies are project-specific and should be re-validated for each new market.

1. Executive Summary & Product Positioning

This is a panel-hung, per-panel DC micro-storage rod that mounts directly under existing PV modules on the mounting rail. Each rod carries its own MPPT optimizer, BMS, DC-arc rapid shutdown and wireless Mesh node. It stores energy locally on the DC side, smooths output, eliminates module mismatch, and can either feed 48 V DC loads directly or pass through the plant's existing central inverter to the grid.

Positioning for overseas sales: the low-cost add-storage and per-panel efficiency retrofit for EXISTING solar plants that have no spare land, cannot stop production, and do not want to replace their inverters. It is not positioned as a replacement for utility-scale container BESS; it targets the structural gap that large BESS and string storage do not serve.

3.2 kWh	1300 W	92%+	IP65	6000
Energy per rod (1-to-2-panel)	Rated charge / discharge power	DC-coupled round-trip efficiency	Enclosure protection	Cycles (~10-year life)

One-line value proposition

• Zero extra land: hangs under the panels — no battery cabin, no concrete foundation, no civil works.

• Per-panel wireless control: one independent Mesh node manages each panel's charge/discharge, precise balancing, mismatch reduction and higher yield.

• Dispersed, safe by design: cells are spread across the array; a single fault cannot cascade into thermal runaway; independent BMS + DC-arc shutdown.

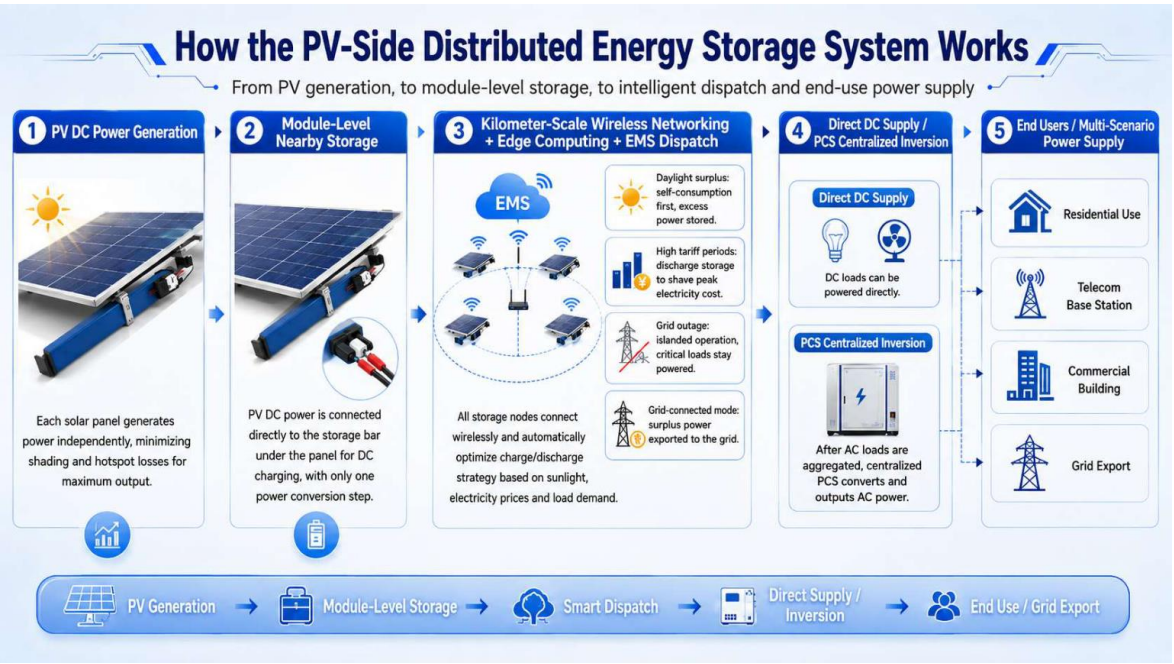
• Modular, knock-down, phased purchase: start with a pilot, scale panel-by-panel; SKD knock-down export supports local assembly and local subsidy qualification.



Cover of the English product deck: Distributed PV-side Energy Storage — turnkey, recyclable ESS.

2. How It Works — Working Principle

A compact storage rod is mounted on the rail beneath one or two PV panels. On the DC side it performs module-level MPPT optimization, charges its own LFP cells, and discharges through DC/DC direct storage. Energy is dispatched locally by an EMS strategy; each rod talks wirelessly to a gateway, which reports to the cloud digital management platform. The original inverter, cabling and grid connection are retained.



Working principle: panel-mounted module, per-panel MPPT, DC coupling, local dispatch; existing inverter and cabling retained, rail-mounted with no additional footprint.

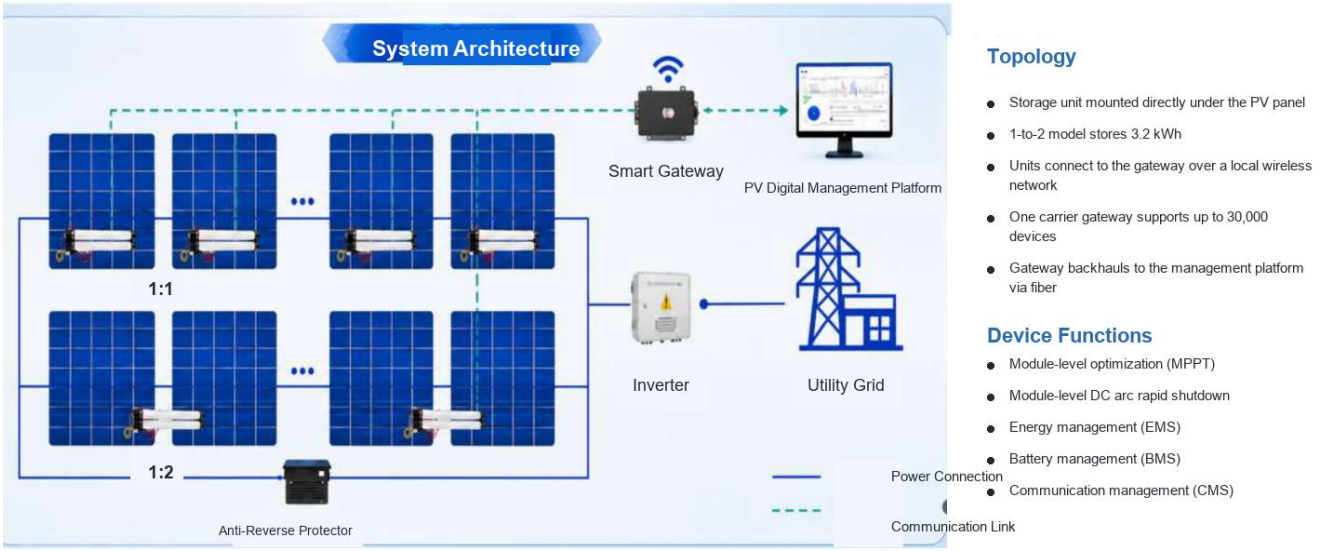
What each rod does

- Module-level MPPT optimizer — tracks each panel's maximum power point independently and removes string mismatch loss.
- DC-coupled local storage — stores surplus solar energy directly on the DC bus without repeated AC/DC conversion.
- Local dispatch / EMS — charges at midday surplus, discharges at peak or evening; supports peak shaving and self-consumption.
- Wireless Mesh node — no communication cabling; self-organizing network to the gateway.
- Rapid shutdown & BMS — per-rod protection, isolation and fault reporting.

System topology (one-to-one / one-to-two)

No change to plant architecture; no extra land or grid-connected equipment

Short build cycle, no grid-connection trial, reduced capital occupation



System architecture: rods mounted directly under PV panels; one-to-one / one-to-two (3.2 kWh) wiring; devices connect locally by wireless to a gateway; a single carrier gateway supports up to 30,000 devices; gateway back-hauls to the management platform over fiber. Functions: module-level MPPT, DC-arc shutdown, EMS, BMS, CMS; anti-reverse-current protector included.

3. Efficiency, Cost & Six Core Advantages

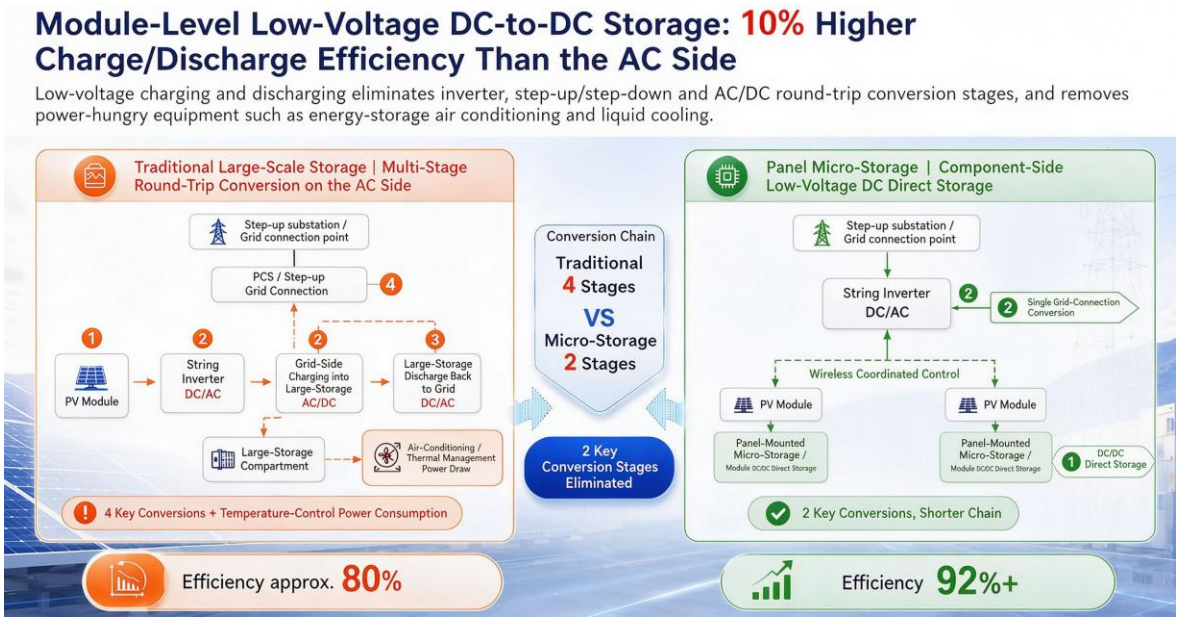
3.1 Higher efficiency, lower cost on the DC side

Low-voltage DC charge/discharge removes inverter, step-up/down and AC/DC back-and-forth conversion stages, and eliminates power-hungry air-conditioning / liquid-cooling thermal management required by large storage. DC direct storage cuts line loss and circulating current; per-panel MPPT removes mismatch loss; modular phased deployment matches investment to need.



Efficiency & cost: DC direct storage reduces AC/DC round trips; per-panel MPPT removes mismatch; modular scaling; lower line loss and circulating current. Revenue: yield gain, peak-valley arbitrage, demand management.

3.2 Conversion-chain comparison: 4 conversions (~80%) vs 2 conversions (92%+)



Component-level low-voltage DC-to-DC storage: charge/discharge efficiency ~10 points higher than the AC side. Traditional large storage = 4 key conversions + thermal-management power draw (~80%); board-level micro-storage = only 2 key conversions, shorter chain (92%+).

Conversion chain	Traditional large BESS (AC side)	Board-level micro-storage (DC side)
Key conversion stages	4 (PV->string DC/AC->AC/DC charge->DC/AC discharge)	2 (DC/DC direct storage + one grid-tie conversion)
Thermal management	Air-con / liquid cooling power draw	Not required (passive)
Round-trip efficiency	~80%	92%+
Chain length	Long, multi-stage round trip	Short, local DC

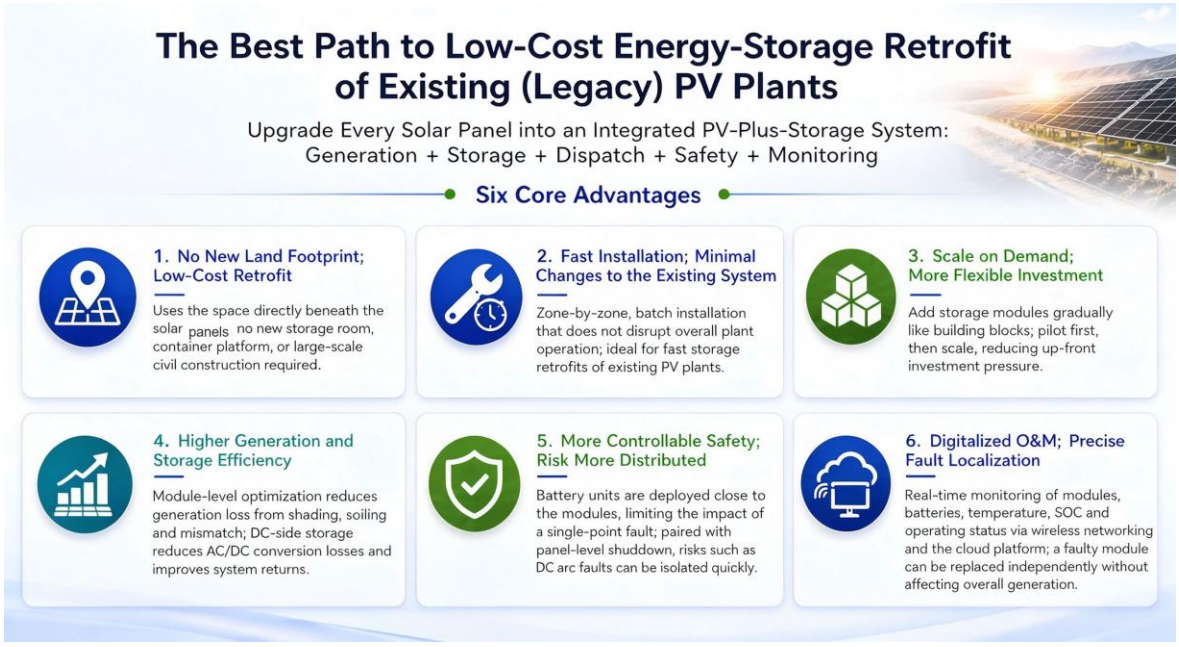
3.3 Lowest EPC — no cabin, no foundation, no extra approval



Lowest EPC: no standalone battery cabin / foundation / fire-engineering; direct rail mounting; no extra land or land-use approval; low-voltage DC avoids high-voltage side connection; hour-scale deployment.

- No independent energy-storage cabin, concrete foundation or dedicated fire-engineering scope.
- Bolt directly onto the module mounting rail; no additional land reservation or land-use approval.
- Low-voltage DC — avoids high-voltage grid-side connection work.
- Hour-scale installation; retrofit can run without a full plant shutdown.

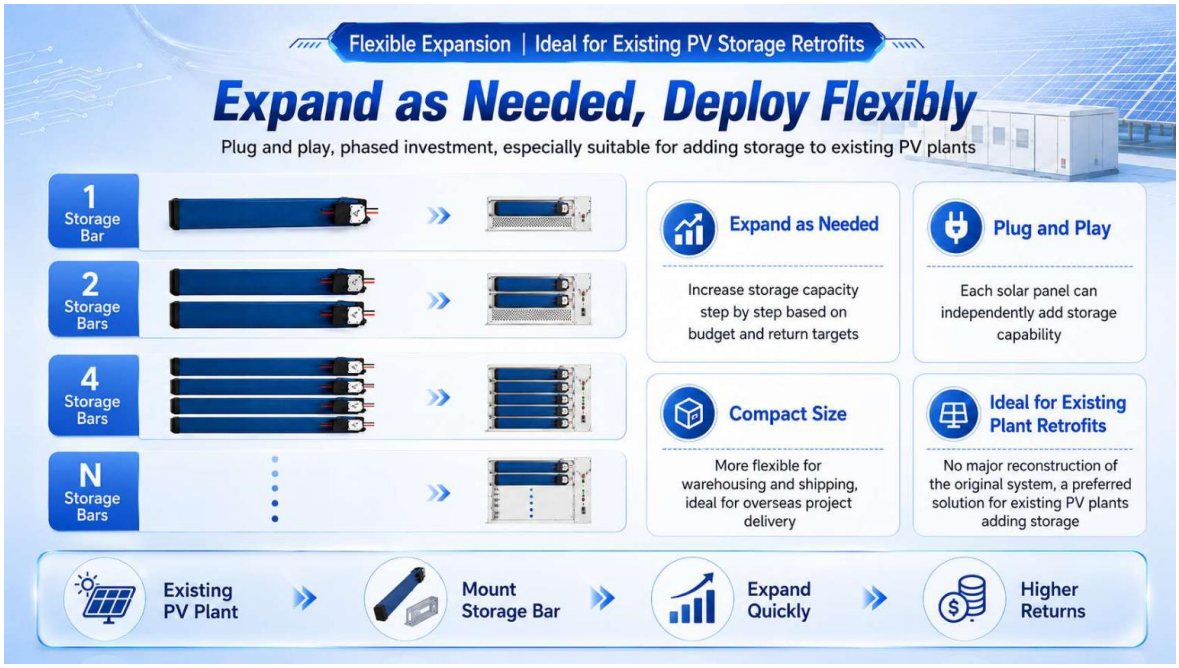
3.4 Six core advantages for low-cost retrofit of existing PV



Six core advantages — low-cost upgrade path for existing PV: zero land occupation; per-panel independent wireless Mesh; dispersed fire-risk control; knock-down modular quick-release; per-panel split export & local assembly; phased, as-needed purchase pilots.

4. System Architecture & Wireless Mesh Networking

4.1 Flexible, modular expansion



Flexible expansion: block-by-block scaling; pilot first then replicate; expand by panel, array or zone; single-unit replacement without affecting the whole plant; capacity grows with demand.

- Start with a small pilot zone, verify returns, then replicate panel-by-panel / array-by-array.
- Expand by panel, string, array or zone — no need to commit full capacity up front.
- A single faulty rod can be replaced without taking the whole array offline.
- Capacity follows demand; investment is phased rather than a single large capex.

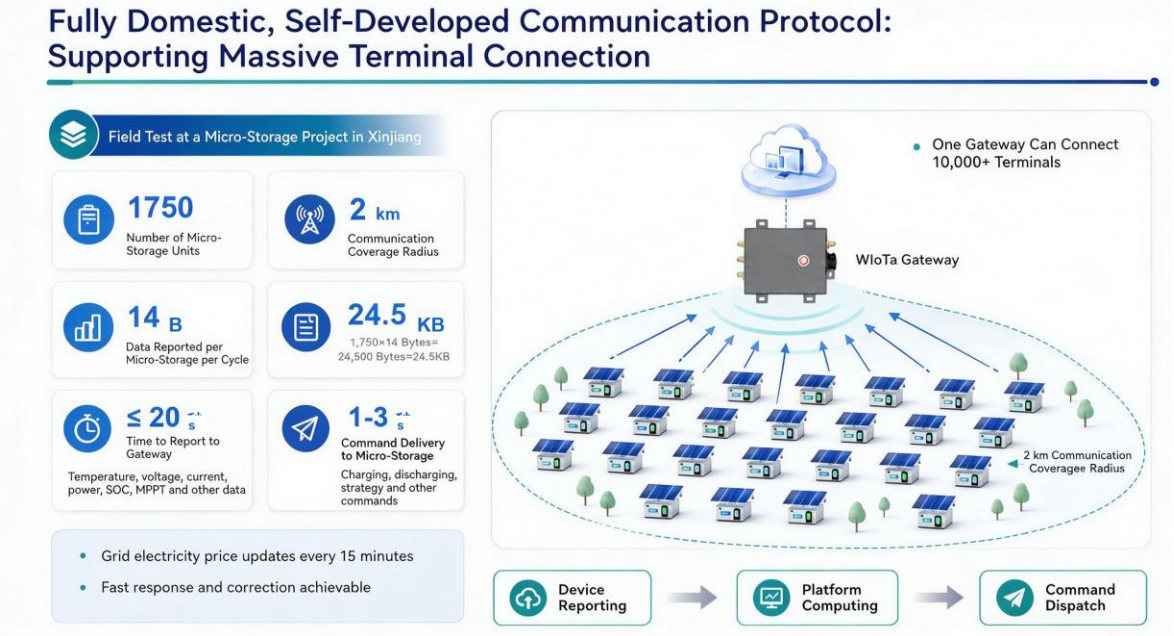
4.2 Wireless Mesh networking & cloud EMS



Wireless networking & EMS: each rod forms an independent self-organizing Mesh network — no communication cabling; cloud EMS with local strategy; real-time SOC / power / temperature monitoring; fault location and remote upgrade.

- Independent wireless Mesh per rod — self-organizing, no signal wiring across the plant.
- Cloud EMS runs local charge/discharge strategy; real-time monitoring of SOC, power and temperature.
- Fault pinpointing, remote diagnostics and firmware upgrade over the air.

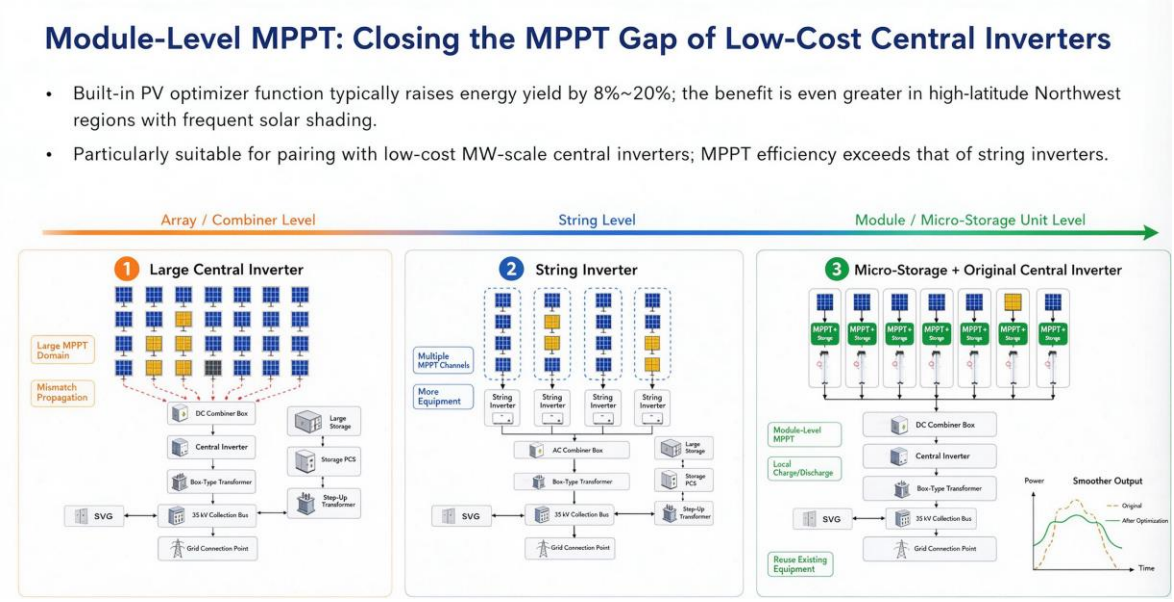
4.3 National proprietary protocol — proven field telemetry (Xinjiang project)



Fully domestic, proprietary communication protocol supporting massive terminal connection. Xinjiang measured field: 1,750 micro-storage units; 2 km coverage radius; 14 B per unit per report; 24.5 kB total; report to gateway ≤20 s; command down to unit 1–3 s. Grid price updates every 15 minutes; fast response correction possible.

Field metric (Xinjiang pilot)	Measured value
Number of micro-storage units	1,750
Communication coverage radius	2 km
Data per unit per report	14 B (1,750x14 = 24.5 kB)
Report to gateway latency	<= 20 s (temperature, voltage, current, power, SOC, MPPT)
Command down to unit	1–3 s (charge, discharge, strategy)
Grid price refresh / fast correction	Every 15 minutes
Single gateway capacity	Up to 10,000+ terminals (carrier gateway up to 30,000 devices)

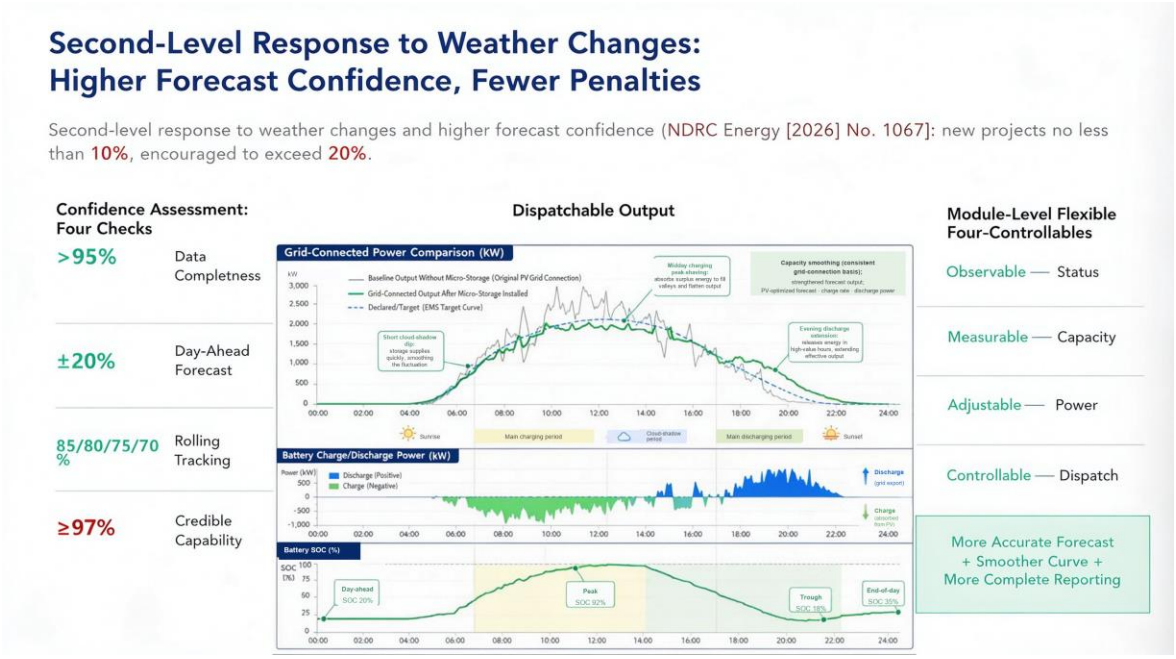
4.4 Component-level MPPT — closing the gap of low-cost central inverters



Component-level MPPT compensates for the weakness of low-cost central inverters. Built-in PV optimizer function typically lifts yield 8%–20% (more visible in high-latitude Northwest regions with shading); especially suitable alongside low-cost MW-class central inverters; MPPT efficiency higher than string inverters.

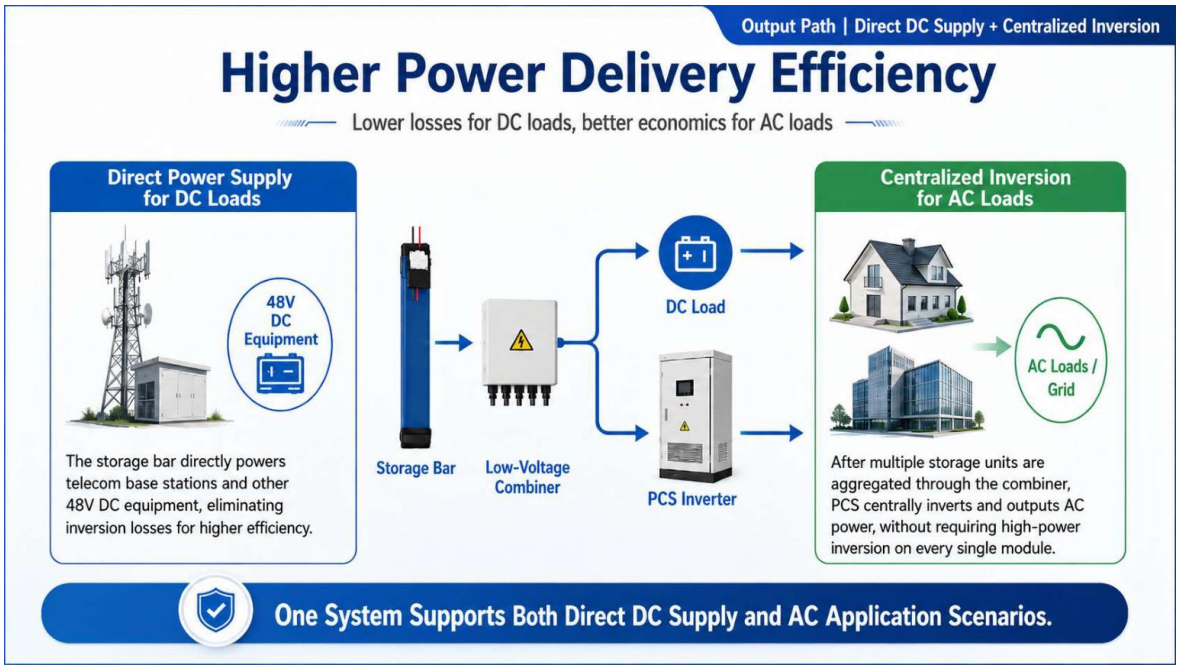
Note: the 8%–20% figure is a typical range, not a guaranteed uniform number; actual gain must be proven with real per-site data before quoting to a customer.

4.5 Second-level response, higher confidence, fewer penalties



Second-level response to weather changes raises confidence and reduces penalties. Confidence assessment: data completeness >95%; day-ahead forecast ±20%; rolling tracking 85/80/75/70%; capability credible ≥97%. Component-level flexible four-observability: observable (status), measurable (capacity), adjustable (power), controllable (dispatch) — more accurate forecast, smoother curve, more complete reporting.

4.6 Power delivery: direct DC supply or centralized inversion



Power delivery: direct DC supply to 48 V loads (e.g. telecom base stations), or AC output through the plant's existing centralized inverter; flexible adaptation to both.

4.7 Core components



Core components: smart optimizer (MPPT), rapid shutdown device (RSD), BMS, wireless gateway.

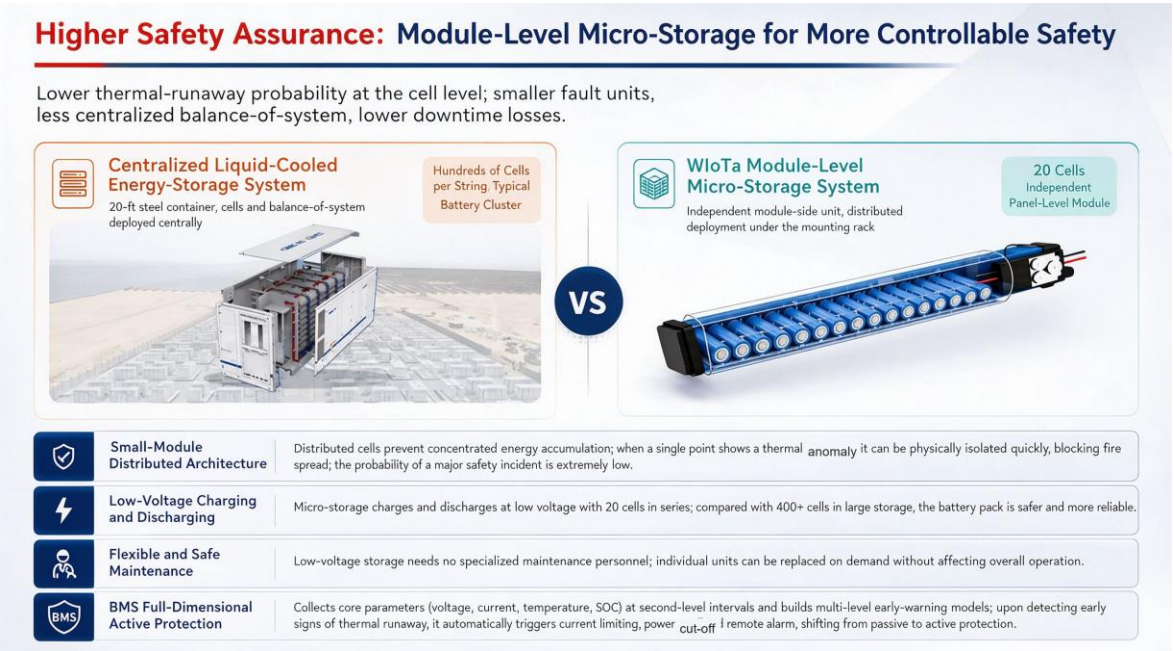
Component	Function
Smart optimizer (MPPT)	Per-panel maximum-power-point tracking; removes mismatch; boosts yield.
Rapid shutdown device (RSD)	DC-arc detection; multi-level fast shutdown of string / inverter / sub-array.
BMS	Cell-level voltage/current/temperature/SOC sampling; multi-level warning; active protection.
Wireless gateway	Aggregates Mesh nodes; local strategy; back-haul to cloud platform over fiber.

5. Five-Layer Safety & DC Arc Rapid Shutdown



Five-layer safety: cell layer, module layer, system layer, network layer, fire linkage; dispersed layout blocks thermal-runaway propagation; DC-arc detection and shutdown.

5.1 Dispersed small modules vs centralized liquid-cooled BESS

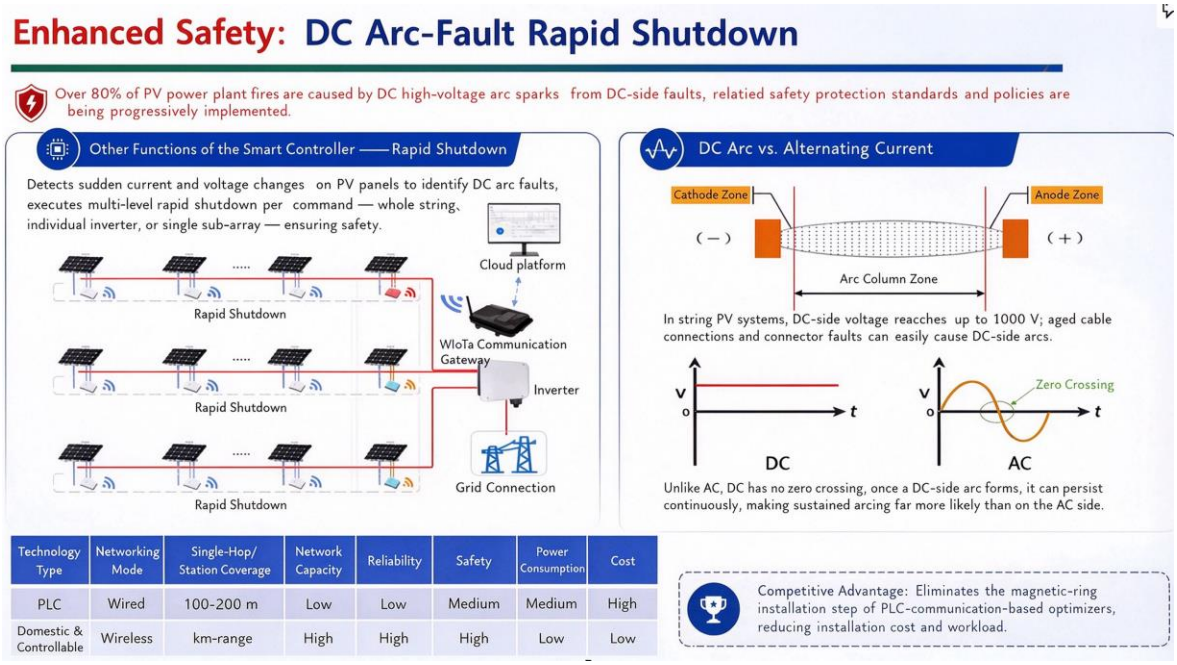


Higher safety: component-level micro-storage is more controllable. Central liquid-cooled system = hundreds of cells in one string (typical battery cluster, 20-ft steel cabin, central deployment) vs WIoTa component-level system = 20-cell independent board-level module dispersed under the rails.

Safety dimension	Central liquid-cooled BESS	WIoTa component-level micro-storage
Architecture	Hundreds of cells clustered, energy concentrated	Small-module distributed; cells spread across the array
Fault isolation	Single point can affect the cluster	Abnormality physically isolated fast; fire path cut; major-incident probability

		very low
Voltage	Hundreds of cells in series	Low-voltage, 20 cells in series per rod; higher pack safety & reliability
Maintenance	Specialized crew required	No specialist crew; replace selected units on demand without stopping the plant
BMS	Basic protection	Full-dimensional active protection; second-level sampling; multi-level warning; limit current / cut power / remote alarm automatically

5.2 DC-arc rapid shutdown



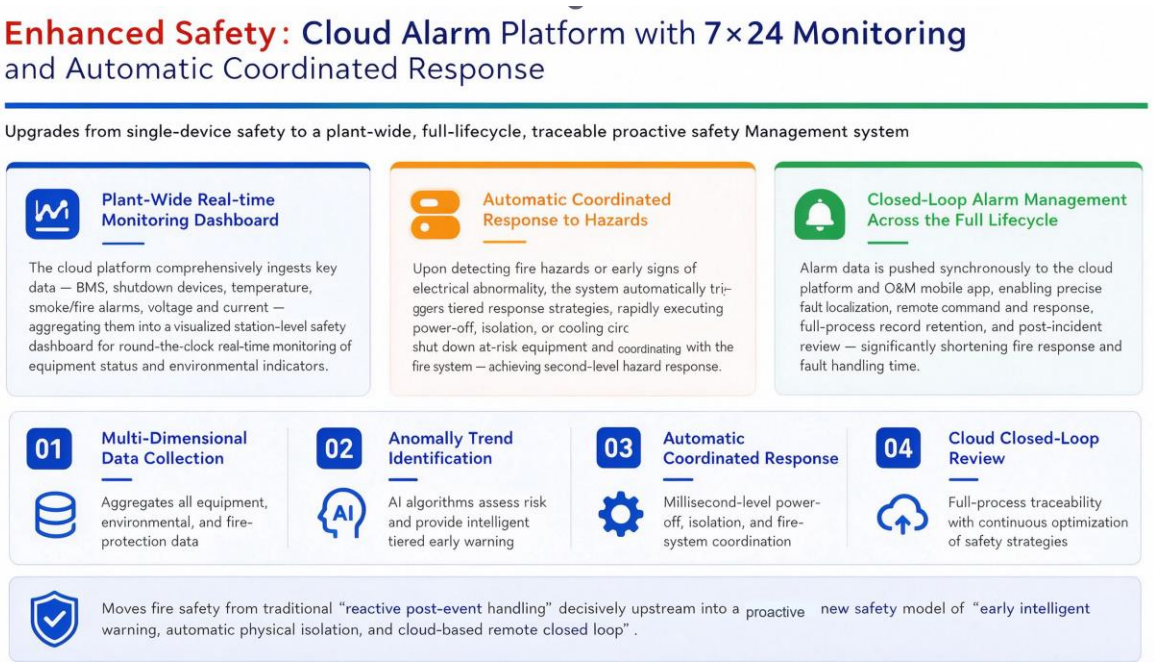
Higher safety: DC-arc rapid shutdown. Over 80% of PV power-plant fires are caused by high-voltage DC arcs from DC-side faults; relevant protection standards and policies are being rolled out. Smart controller detects sudden current/voltage change, commands multi-level fast shutdown of whole string / single inverter / single sub-array.

String PV systems carry up to 1000 V on the DC side; aged cabling and connector faults easily produce DC arcs. Unlike AC, DC has no zero-crossing point — once a DC arc forms it sustains itself, so the DC side carries a far higher sustained-arc probability than the AC side.

Technology	Network	Single-hop / site coverage	Capacity	Reliability	Safety	Power use	Cost
PLC (wired optimizer)	Wired	100–200 m	Low	Low	Medium	Medium	High
Proprietary wireless (domestic)	Wireless	Kilometer scale	High	High	High	Low	Low

Competitive edge: no magnetic-ring installation step of PLC-wired optimizers, cutting install cost and labor.

5.3 Cloud alarm platform: 24/7 monitoring & automatic linked response



Higher safety: cloud alarm platform 7×24 monitoring and automatic linked handling — upgrades single-device safety to a plant-wide, full-lifecycle, traceable active safety system.

• Plant-wide real-time dashboard: cloud aggregates BMS, breaker, temperature, smoke alarm, voltage/current;round-the-clock monitoring of equipment status and environment.

• Automatic linked response: on detecting fire/electrical anomaly, auto triggers tiered response — cut power, isolate or cool circuits, shut risky devices, link fire system; second-level handling.

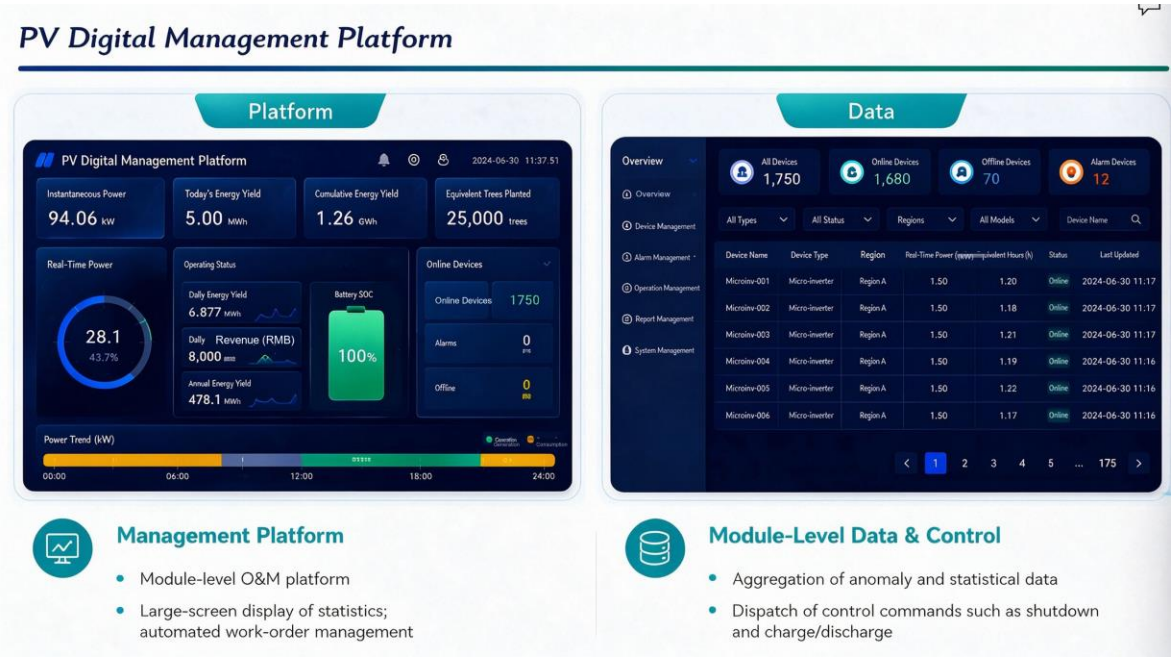
• Closed-loop alarm control: alarms pushed to cloud and O&M mobile; precise fault location, remote command, full record kept for post-event review; shorter response and repair time.

• Four steps: multi-dimensional data acquisition → AI anomaly-trend identification → auto linked response (ms-level cut/isolate/fire linkage) → cloud closed-loop review.

• Moves fire safety from passive post-event response to early smart warning, automatic physical isolation, cloud remote closed-loop.

6. Cloud EMS & Digital Management Platform

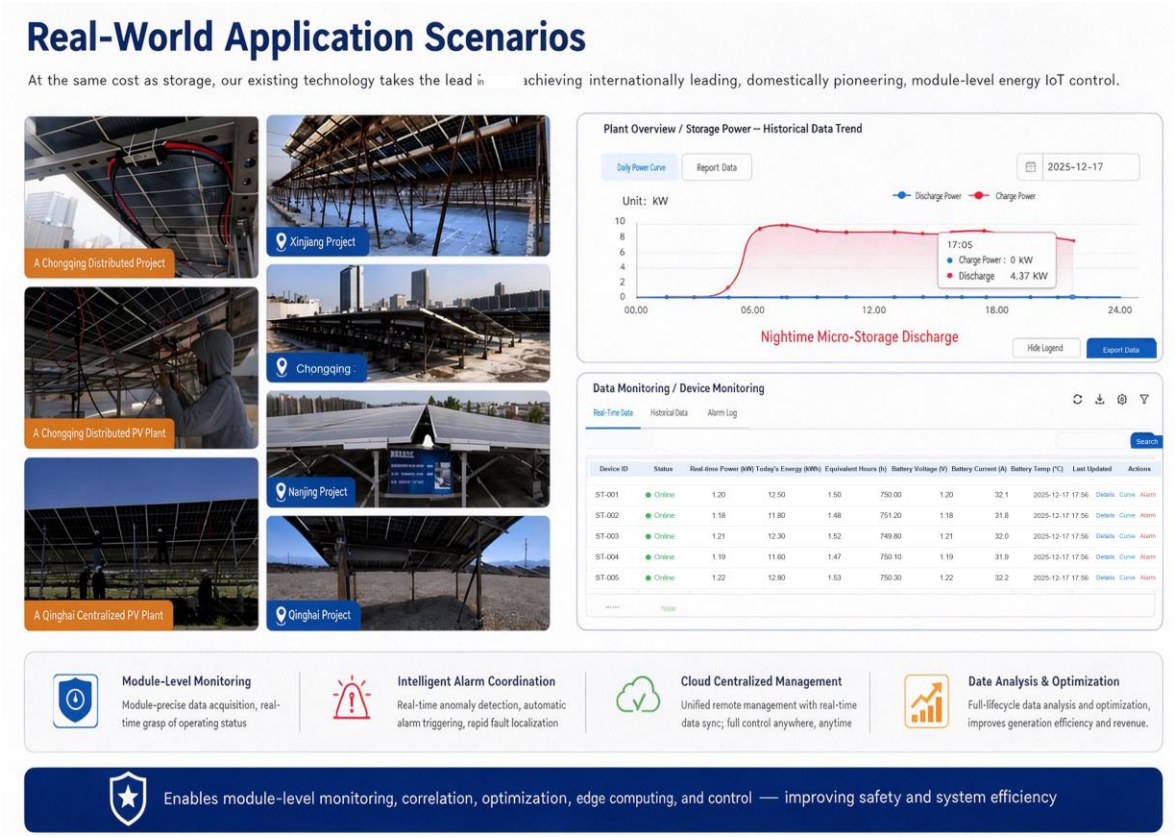
The PV digital management platform provides component-level O&M, large-screen statistics, automatic work-order management, and per-panel data & control: anomaly and statistics aggregation, shutdown / charge-discharge command dispatch.



Management platform: component-level digitalization. Left dashboard — real-time power, today's yield, cumulative yield, equivalent trees, storage SOC; right — device management (1,750 devices, online/offline/alarm counts, per-unit real-time power and equivalent hours).

Platform layer	Capabilities
Component-level O&M; platform	Per-panel operation and maintenance; large-screen statistics; automatic work-order dispatch.
Component-level data & control	Anomaly & statistics aggregation; shutdown, charge/discharge command dispatch.
Monitoring	Precise per-panel data acquisition; real-time operating status.
Alarms	Abnormality detected in real time; auto alarm; fast fault location.
Central control	Remote unified management; real-time data sync; global overview anywhere.
Analytics	Full-lifecycle data analysis and optimization; higher generation efficiency and revenue.

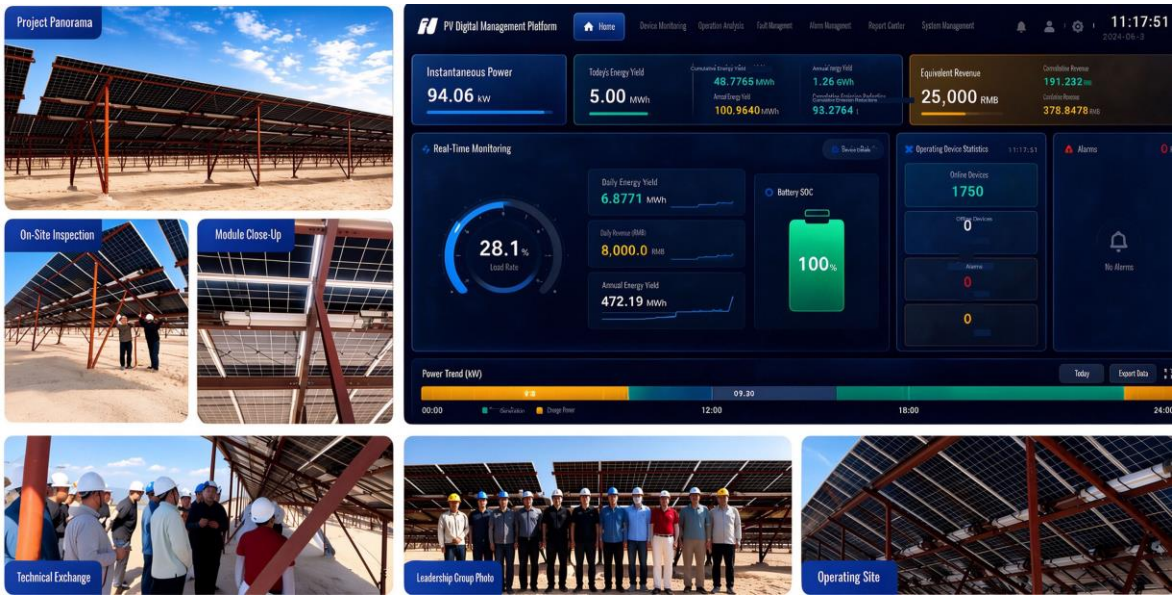
6.1 Deployed application scenarios & live cloud monitoring



Actual deployment: existing technology reaches internationally leading, domestic-first component-level energy IoT control at the same storage cost. Project sites shown: Chongqing distributed project, Xinjiang project, Chongqing distributed PV station, Chongqing project, Qinghai centralized PV station, Nanjing project; right panel — station overview / storage power historical trend and live device monitoring table (night micro-storage discharge shown).

- Component-level monitoring — precise per-panel data acquisition, real-time status.
- Smart alarm linkage — real-time anomaly recognition, auto alarm, fast fault location.
- Cloud central control — remote unified management, real-time sync, global overview.
- Data analytics optimization — full-lifecycle analysis to raise efficiency and revenue.

6.2 Project panorama, inspection & operations



Project panorama, on-site inspection, module detail, technical exchange, leadership group photo and running site; cloud dashboard showing 1,750 online devices, real-time load rate, storage SOC and cumulative revenue.

6.3 Proven in harsh environments (large Northwest stations)

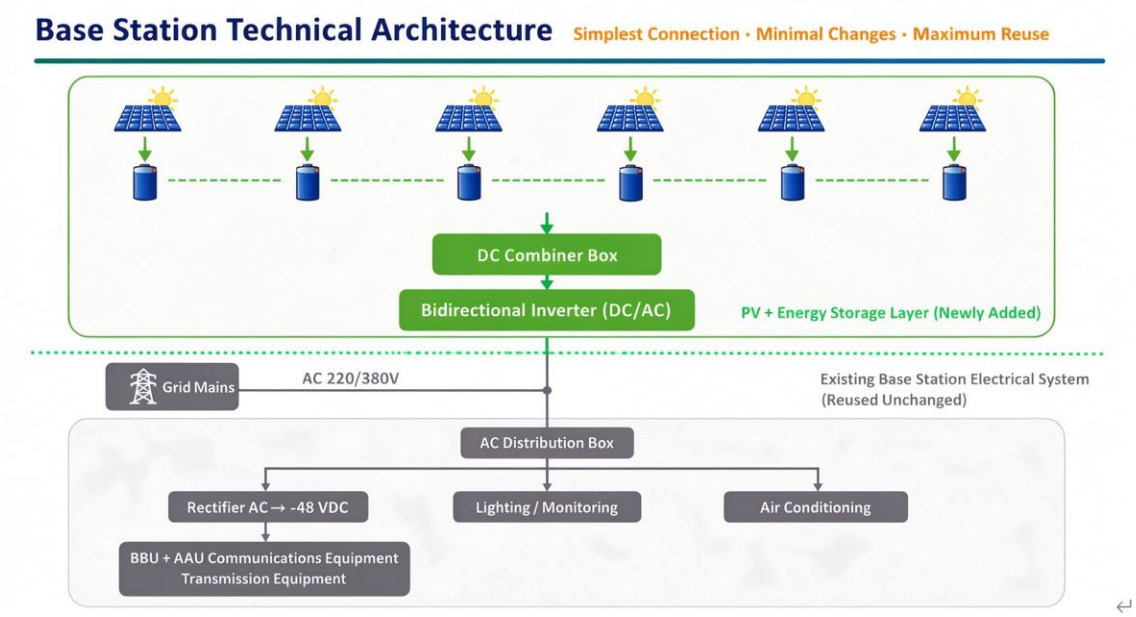


Harsh-environment application: large Northwest China ground-mount station under desert sun; rods mounted under the rails in sandy, high-temperature, high-dust conditions.

7. Telecom Base Station Green-Power Solution

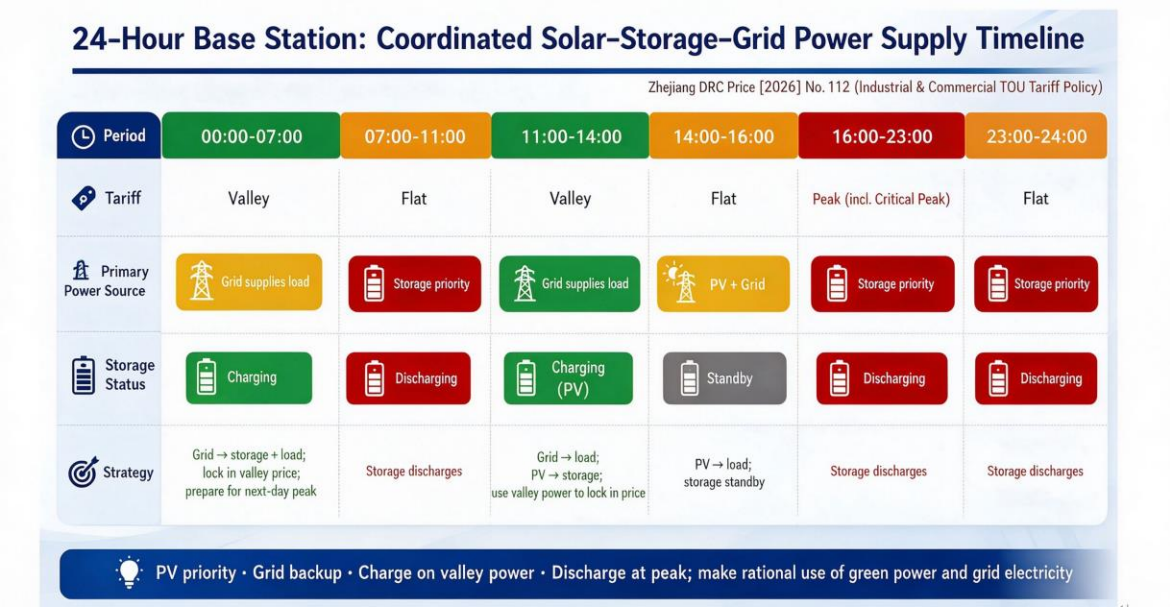
Simplest connection, minimal change, maximum reuse of existing equipment. A new PV+storage layer is added on top of the station's original electrical system, which is left untouched.

7.1 Base-station technical architecture



Base-station architecture: simplest access, minimal modification, maximum reuse. New PV+storage layer feeds a DC combiner box and bidirectional inverter (DC/AC); the existing mains AC 220/380 V, AC distribution box, rectifier AC→-48 VDC, BBU+AAU communication/transmission equipment, lighting/monitoring and air-con are retained unchanged.

7.2 24-hour PV–storage–mains coordinated supply timeline

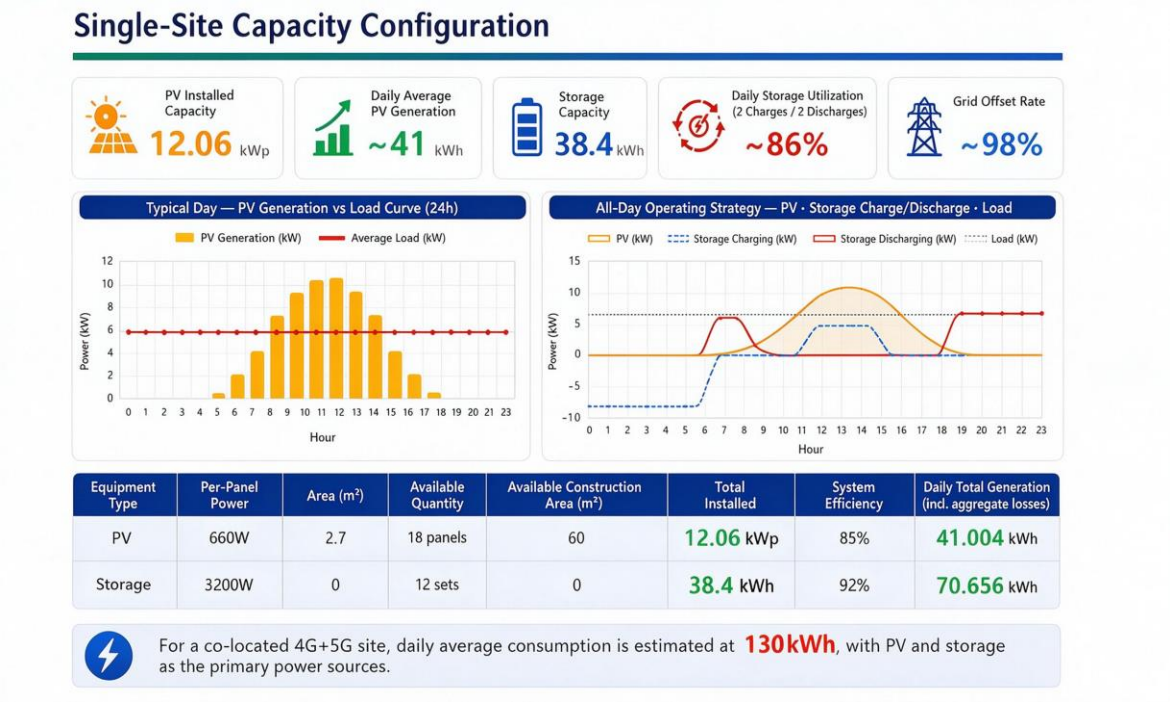


24-hour coordinated supply under time-of-use pricing (low / flat / peak tariff): PV priority, mains backup, valley charging, peak discharging; green power and mains used rationally. Strategy shifts by time band: mains-to-storage+load at night valley, storage discharge in morning peak, PV charging at midday, standby afternoon, storage discharge in evening peak.

7.3 Per-station capacity configuration (typical 4G+5G shared site)

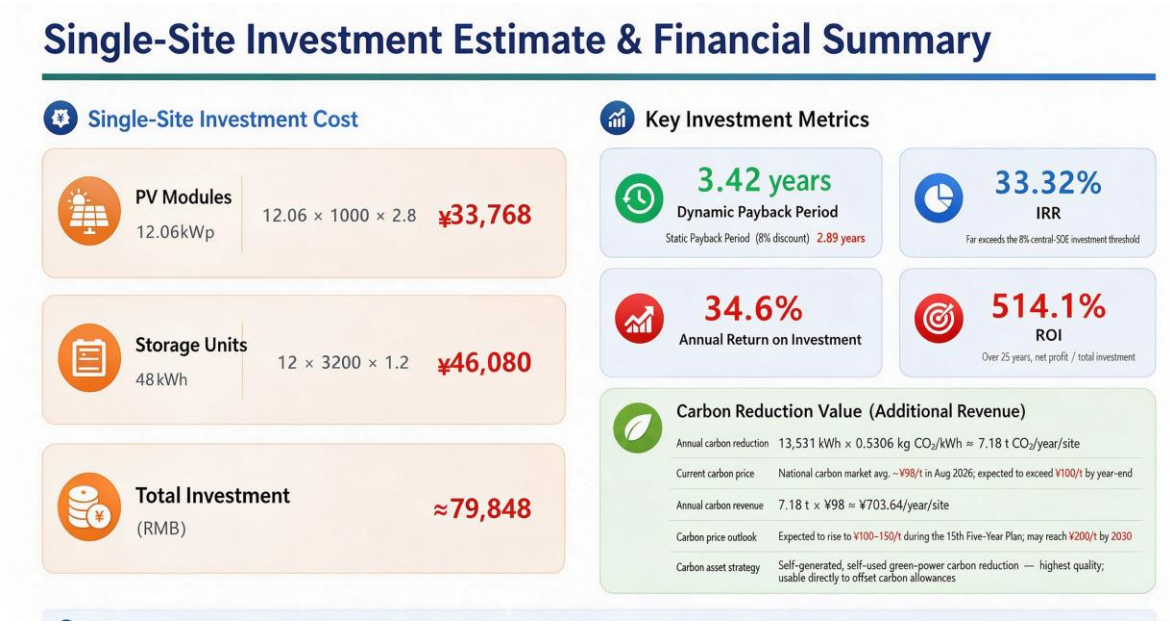
12.06 kWp	~41 kWh	38.4 kWh	~86%	~98%
	Average daily PV		Storage utilization (2	

PV installed capacity	generation	Storage configured	cycles/day)	Grid replacement rate



Per-station capacity: typical-day PV vs load curve and all-day PV/storage charge-discharge/load strategy. Table: PV 660 W panels, 18 units, 60 m² usable area, 12.06 kWp, 85% system efficiency, 41.004 kWh daily generation; storage 3200 W, 12 sets, 38.4 kWh, 92% efficiency, 70.656 kWh total daily. Basis: 4G+5G shared station ~130 kWh/day, PV+storage as primary supply.

7.4 Per-station investment & economics

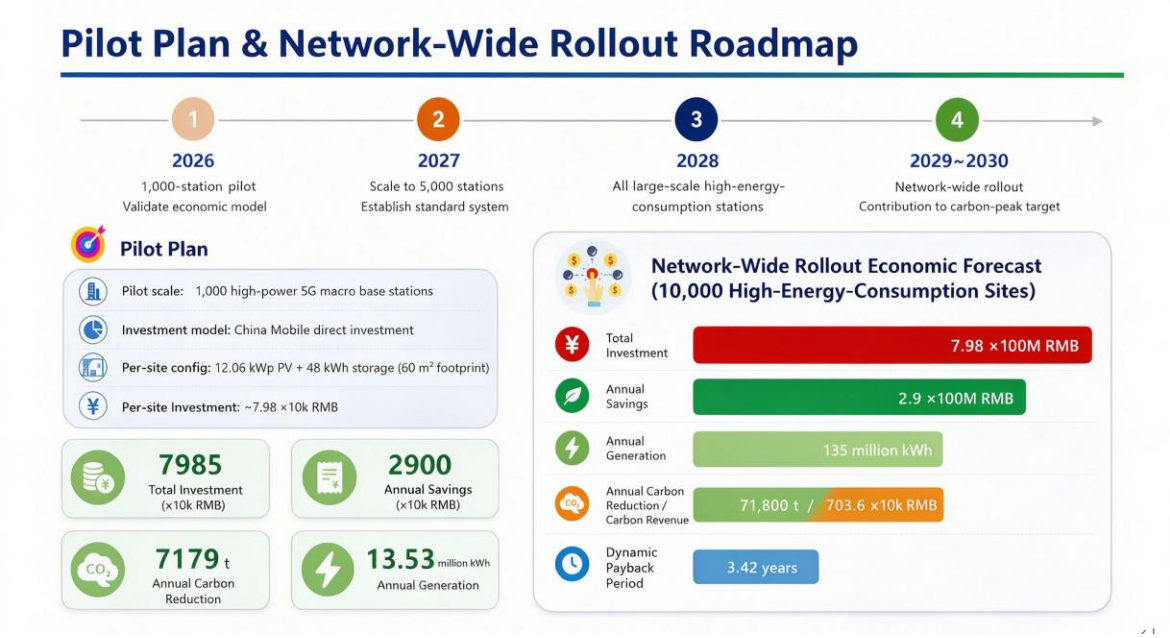


Per-station investment and economics. Cost: PV modules 12.06 kWp = 33,768 CNY; storage units 48 kWh = 46,080 CNY; total ~79,848 CNY. Core metrics: 3.42-year dynamic payback (2.89-year static at 8% discount); IRR 33.32% (far above the 8% SOE hurdle); annual return 34.6%; 25-year ROI 514.1%. Carbon: ~7.18 t CO2/yr/station; carbon value ~703.64 CNY/yr at ~98 CNY/t.

Investment item	Calculation	Amount (CNY)
PV modules (12.06 kWp)	12.06 x 1000 x 2.8	33,768
Storage units (48 kWh)	12 x 3200 x 1.2	46,080
Total investment	—	~79,848

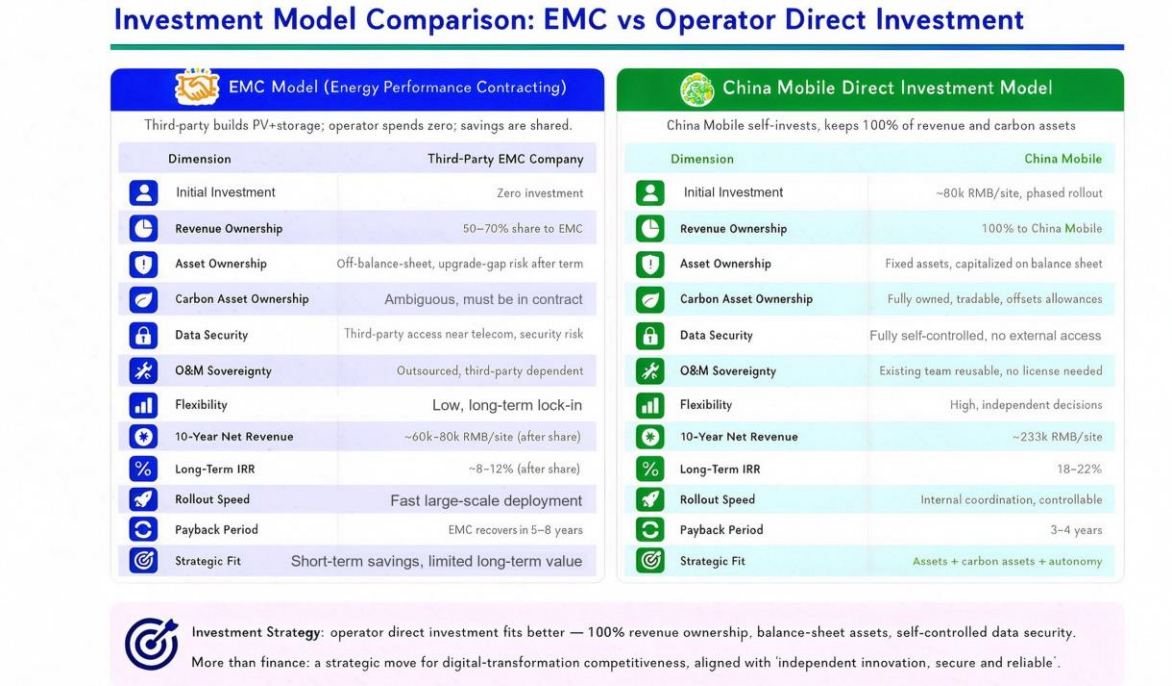
Assumptions from China Mobile Energy 2025 public data: 0.8 CNY/kWh; PV life 25 years (330 days/yr); storage life 10 years (reset at year 10). These are domestic-project figures and are shown for reference only.

7.5 Pilot scheme & network-wide rollout path



Pilot and rollout path: 2026 1,000-station pilot (validate economic model) → 2027 expand to 5,000 stations (build standards) → 2028 large-scale high-consumption stations → 2029–2030 network-wide (carbon-peak contribution). Pilot: 1,000 high-power 5G macro stations; China Mobile direct investment; 12.06 kWp PV + 48 kWh storage (60 m²); ~79,800 CNY/station. 10,000-station forecast: total 798 M CNY, annual saving 290 M CNY, annual generation 135 GWh, annual carbon 71,800 t.

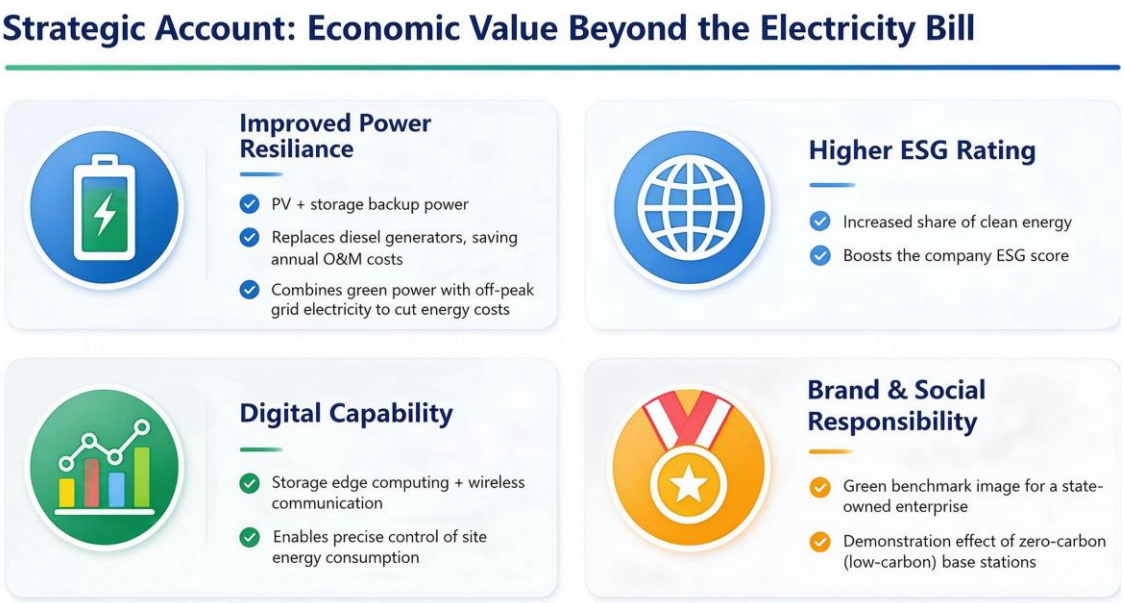
7.6 Investment model: EMC vs operator direct investment



EMC (Energy Management Contracting) vs operator direct investment comparison across initial investment, revenue ownership, asset ownership, carbon ownership, data security, O&M sovereignty, flexibility, 10-year net revenue, long-term IRR, rollout speed, payback, strategic fit.

Dimension	Third-party EMC	Operator direct investment
Initial investment	Zero investment (third party builds)	~80k/station, phased
Revenue ownership	50–70% to EMC	100% to operator
Asset ownership	Off balance sheet; post-term asset-disruption risk	Booked as fixed asset, capitalizable
Carbon asset	Unclear ownership, needs contract	Full ownership; tradable, offsettable
Data security	Third party beside telecom equipment, risk	Fully self-controlled, no external access
O&M; sovereignty	Outsourced, dependent on third party	Existing team reused; low-voltage, no specialist license
Flexibility	Low, long-term binding	High, autonomous decisions
10-yr net revenue	~60–80k/station (after split)	~233k/station
Long-term IRR	~8–12% (after split)	18–22%
Payback	EMC party 5–8 years	3–4 years

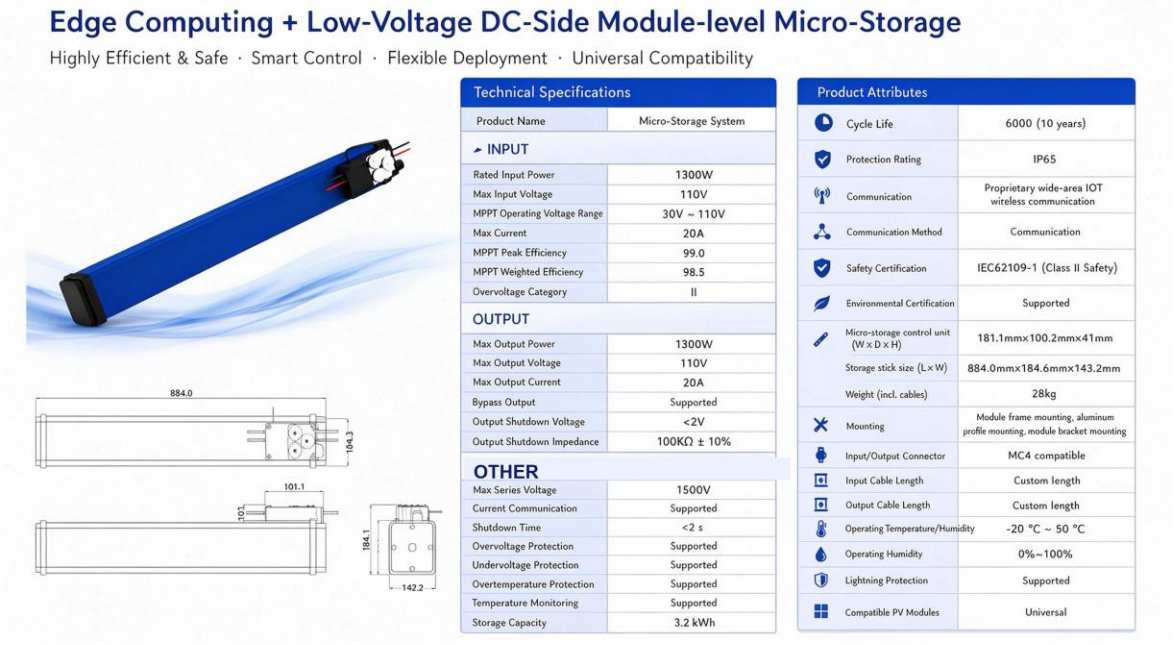
7.7 Strategic value beyond the electricity bill



Strategic account: value beyond electricity cost — supply resilience (PV+storage backup, replace diesel, valley-tariff combine to lower cost), ESG rating uplift (cleaner mix, ESG score), digital capability (edge computing + wireless, precise energy control), brand & social responsibility (green benchmark, zero/low-carbon station demonstration).

8. Technical Specifications (Full Datasheet)

Edge computing + low-voltage DC-side component micro-storage: efficient & safe, smart control, flexible deployment, all-scenario fit.



Technical Specifications	
Product Name	Micro-Storage System
INPUT	
Rated Input Power	1300W
Max Input Voltage	110V
MPPT Operating Voltage Range	30V ~ 110V
Max Current	20A
MPPT Peak Efficiency	99.0
MPPT Weighted Efficiency	98.5
Overvoltage Category	II
OUTPUT	
Max Output Power	1300W
Max Output Voltage	110V
Max Output Current	20A
Bypass Output	Supported
Output Shutdown Voltage	<2V
Output Shutdown Impedance	100KΩ ± 10%
OTHER	
Max Series Voltage	1500V
Current Communication	Supported
Shutdown Time	<2 s
Overvoltage Protection	Supported
Undervoltage Protection	Supported
Overtemperature Protection	Supported
Temperature Monitoring	Supported
Storage Capacity	3.2 kWh

Product Attributes	
Cycle Life	6000 (10 years)
Protection Rating	IP65
Communication	Proprietary wide-area IOT witeless communication
Communication Method	Communication
Safety Certification	IEC62109-1 (Class II Safety)
Environmental Certification	Supported
Micro-storage control unit (W x D x H)	181.1mmx100.2mmx41mm
Storage stick size (L x W)	884.0mmx184.6mmx143.2mm
Weight (incl. cables)	28kg
Mounting	Module frame mounting, aluminum profile mounting, module bracket mounting
Input/Output Connector	MC4 compatible
Input Cable Length	Custom length
Output Cable Length	Custom length
Operating Temperature/Humidity	-20 °C ~ 50 °C
Operating Humidity	0%~100%
Lightning Protection	Supported
Compatible PV Modules	Universal

Product appearance and engineering drawings; specification tables (technical indicators and product attributes) transcribed below.

8.1 Technical indicators

Parameter	Value
Product	Micro-storage system
--- INPUT ---	
Rated input power	1300 W
Max input voltage	110 V
MPPT operating voltage range	30 V ~ 110 V
Max current	20 A
MPPT max efficiency	99.0%
MPPT weighted efficiency	98.5%
Overvoltage category	II
--- OUTPUT ---	
Max output power	1300 W
Max output voltage	110 V
Max output current	20 A
Bypass output	Supported
Output shutdown voltage	<2 V
Output shutdown impedance	100 kOhm, +/-10%
--- OTHER ---	
Max series voltage	1500 V
Current communication	Supported
Shutdown time	<2 s
Over-voltage protection	Supported
Under-voltage protection	Supported
Over-temperature protection	Supported
Temperature monitoring	Supported
Storage capacity	3.2 kWh

8.2 Product attributes

Attribute	Specification
Cycle life	6000 cycles (~10 years)
Protection rating	IP65
Communication	Proprietary wide-area IoT wireless communication (fully self-owned IP)
Communication mode	Wireless
Safety certification	IEC 62109-1 (Class II safety)
Environmental certification	Supported
Control unit size (WxDxH)	181.1 x 100.2 x 41 mm
Storage rod size (LxWxH)	884.0 x 184.6 x 143.2 mm
Weight (incl. cabling)	28 kg
Mounting	Module frame mount / aluminum profile mount / module-rail mount
Input/output connector	MC4 compatible
Input cable length	Custom length
Output cable length	Custom length
Operating temperature	-20 °C ~ +50 °C
Operating humidity	0% ~ 100%
Lightning protection	Supported
PV module compatibility	Fully compatible (all modules)

9. Target Markets & Country Priority

The realistic beachhead is existing-PV add-storage, telecom 48 V DC, off-grid/weak-grid and local-assembly subsidy segments — not a frontal fight against utility container BESS or the residential storage brands. Enter via local EPC / channel partners; pilot first, scale later.

9.1 Tier-1 markets (invest sales resources first)

Market	Why it fits	Priority customers / channels
India	Fast-growing PV, many large plants, cost-sensitive, local-assembly policy; mismatch, dust and heat are acute; weak grid & land issues	Adani Green, ReNew, Tata Power Solar, Azure Power, ACME Solar, Waaree, Vikram Solar, Fourth Partner Energy, Amplus Solar; local EPC & storage integrators
South Africa	Load-shedding / unstable grid; strong PV+storage demand; C&I; buyers invest in backup; telecom & commercial demand	Eskom supply chain, Vodacom, MTN SA, Telkom, Cell C, IHS Towers, African Rainbow Energy, Scatec, SolarAfrica; C&I; PV EPC
Australia	High PV penetration, high tariffs, large installed base, curtailment/export limits, high C&I; storage acceptance	Origin Energy, AGL, EnergyAustralia, CleanPeak Energy, Neoen Australia, ARENA partners; local retrofit EPC, energy service companies
Gulf (KSA, UAE, Oman, Jordan)	Strong irradiance, large PV projects, many remote energy sites; heat & dust raise O&M; cost; local manufacturing/delivery valued	ACWA Power, Masdar, DEWA supply chain, Saudi Electricity Co. supply chain, NEOM contractors, Yellow Door Energy, SirajPower; oil/gas/mining/remote-facility EPC
East & West Africa (Kenya, Nigeria, Tanzania, Egypt, Morocco)	Large tower count, expensive diesel, many off-grid/weak-grid projects; light transport & fast deployment needed	IHS Towers, Helios Towers, American Tower, MTN, Airtel, Safaricom, Orange, Maroc Telecom; local telecom-energy providers, microgrid/off-grid EPC

Priority order in Africa: telecom towers > off-grid industrial loads > C&I rooftops > large ground-mount PV.

9.2 Tier-2 markets (build channels)

• Brazil: large installed PV, fast C&I growth, remote/weak-grid pockets; complex tax/certification/channel. Targets: Comerc Energia, Solfácil-type distribution, Atlas Renewable Energy, Neoenergia, Comerc Renew.

• Chile: large northern PV & mining; curtailment, negative prices, transmission congestion; strong mining/remote demand. Targets: Enel Chile, AES Andes, Colbún, Atlas, Sonnedix; mining companies and mine-energy EPC.

• Southeast Asia (Philippines, Indonesia, Vietnam, Thailand, Malaysia): island microgrids, industrial parks, telecom towers, commercial rooftops, weak-grid backup.

9.3 Certification & market-access matrix

Priority	Country / region	Core driver	Key access / certification
Tier 1	USA (IRA/ITC, local mfg, NEC RSD, NEM3.0; TX/HI/PR weak grid)	Local manufacturing, fast shutdown, weak grid	UL 9540/9540A, UL 1741 SB, IEEE 1547, NEC, FCC
Tier 1	Australia	High rooftop PV, negative prices, weak grid, VPP/FCAS, subsidies	CEC, AS/NZS 4777, AS/NZS 5139

Tier 1	Germany / Italy / Spain / UK	High tariffs, negative prices, grid-capacity limits, old-PV retrofit	CE, VDE, EN 50549, IEC 62619
Tier 1	India	Tower diesel replacement, off-grid, PLI local mfg, weak grid	BIS, IEC, local-manufacturing policy
Tier 1	South Africa	Load shedding, peak-valley spread, mining, towers	NRS, SANS
Tier 1	Philippines/Indonesia/Vietnam/Thailand/Malaysia	Island towers, weak grid, costly diesel, fast deploy	IEC, local standards
Tier 1	KSA/UAE/Oman/Morocco/Egypt	Large PV+storage, heat, microgrids, new cities	SASO, ESMA, IEC
Tier 1	Brazil/Chile/Mexico/Colombia/Peru	Distributed, mining, weak grid, peak	INMETRO, ANEEL, NOM, RETIE
Tier 2	Nigeria/Kenya/Tanzania/Ghana	Power shortage, diesel, towers, off-grid	IEC, local
Tier 2	Pakistan/Bangladesh	Power shortage, diesel, telecom	IEC, local
Tier 2	Japan/Korea	Land scarcity, disaster resilience, high tariffs	PSE, JET, KC
Tier 2	Mongolia / Central Asia	Mining, remote, weak grid	IEC, local
Tier 2	Caribbean / Pacific islands	Off-grid, diesel, disasters	IEC, local

9.4 Low-certification / fastest routes to first order

Strictly speaking, no country legally sells a complete BESS with zero certification; transport, safety and local electrical compliance files are still needed. But three routes avoid the heavy grid-tied process:

- Scenario-exempt (pure off-grid / DC): 48 V off-grid telecom towers (operator private DC microgrid; 48 V is SELV, outside high-voltage/grid approval); off-grid PV pumping / ranch DC systems; remote no-power mines / border posts / temporary camps replacing diesel.

- Low-regulation regions: most of Africa (Nigeria, Zimbabwe, DRC, Kenya — basic COC/PVOC pre-shipment check); Central Asia (Kazakhstan, Uzbekistan — general LVD/border trade); parts of Latin America (Bolivia, Paraguay, Honduras — commercial invoice + generic factory certificate, unlike Brazil INMETRO / Chile SEC).

- Model-exempt: declared as a PV smart optimizer (DC optimizer) + maintenance spare under an existing plant's internal upgrade/spare-parts flow; exported as SKD knock-down kits (cells, BMS board, housing, harnesses as electronic components) for local simple assembly, bypassing whole-unit system certification.

Fastest first orders: overseas tower operators on 48 V DC (closed network, internal standards, bulk buy after passing test); Africa/Middle East/LatAm off-grid diesel-replacement EPC (only UN38.3 + MSDS shipping safety report needed to deploy and earn).

10. Target Customers & Ready-to-Sell Scenarios

Twenty ready-to-sell scenarios, grouped by beachhead. For each: core pain, recommended fit, and the customer type / role to approach. Use LinkedIn Sales Navigator: target company + Energy / Infrastructure / Procurement / CTO; send a pain-specific note, never a generic brochure.

Group A — Four core beachhead scenarios

#	Scenario	Core pain	Recommended fit / target customer
1	Remote telecom base stations (off-grid / weak grid)	Reliance on costly, high-maintenance diesel; equipment runs on 48 V DC; centralized lead-acid/Li theft-prone with single-point risk	48 V DC direct supply, wireless monitoring, modular phased rollout. Target: tower cos (IHS, Helios, American Tower), MTN/Airtel/Safaricom/Orange
2	Off-grid & microgrid diesel replacement	Mine camps, remote islands, irrigation depend on diesel at $0.4–1.0+/kWh; container storage needs heavy lifting and costly logistics	Dispersed rods, light transport, fast deploy. Target: off-grid solar wholesalers, diesel-replacement EPC, private mine owners
3	Existing C&I; PV rooftop add-storage (peak shaving)	Want storage but roof can't bear a big cabinet; no ground space for containers; indoor/ground storage faces strict fire review	Under-panel dispersed storage, per-panel MPPT, phased. Target: C&I; PV EPC, energy service companies, property sustainability teams
4	SKD knock-down local assembly (tariff / subsidy)	India/Brazil levy high whole-unit tariffs but reward local manufacture/assembly with rebates/subsidy	Export cells, BMS board, housing, harnesses as electronic components; local simple screw assembly; bypass whole-unit certification. Target: local assemblers, integrators

Group B — Hidden-demand niches

#	Scenario	Core pain	Recommended fit / target customer
5	Agricultural PV direct-drive irrigation	Pumps stop on cloudy/evening hours; farmers can't afford inverter+big battery; centralized batteries easily stolen	DC direct drive, anti-theft dispersed. Target: Middle-East desert agriculture, South-American farms, Central-Asia irrigation projects
6	Oil/gas pipeline cathodic protection & SCADA	No grid, extreme environment, zero tolerance for downtime; needs corrosion protection and data acquisition power	Off-grid independent energy, dispersed safe. Target: pipeline operators, oilfield EPC
7	Highway service-area fast-charging hubs	Grid capacity insufficient; dedicated line prohibitively costly; AC-coupled chain (PV DC->inv AC->storage DC->inv AC->charger DC) very inefficient	DC direct, efficient local storage. Target: charging-network operators, transport-department energy teams
8	Refugee camps / post-disaster / field-hospital cold chain	Need lighting and vaccine refrigeration (12/24/48 V DC); simplest logistics and	Plug-and-play DC modules. Target: UNHCR / international NGO relief

		foolproof install required	procurement, local distributed-energy distributors

Group C — Scale breakout markets

#	Scenario	Core pain	Recommended fit / target customer
9	European balcony PV / micro-storage distribution	800–2000 W balcony systems; daytime surplus exported for free (no/limited feed-in revenue); payback too long without storage	Low-voltage DC micro-storage compatible with all micro-inverters; plug-in expansion; lift self-use to 90%+; ready for EU private-label/distribution. Target: balcony-PV distributors (B2B bulk, thousands per order)
10	Zero-carbon logistics / warehouse rooftops	Amazon/DHL/JD push zero-carbon warehousing; huge flat roofs but fire/load and space constraints block big cabinets	Under-panel dispersed, light, fire-safe. Target: global 3PL/retail sustainability, facility management directors

Group D — Scenarios where traditional storage is disqualified

#	Scenario	Core pain	Recommended fit / target customer
12	Floating solar (FPV)	Tens-of-tons containers cannot sit on water; shore DC cables lose heavily; shore has no spare land (steep slope / protected wetland)	Rods dispersed on existing float bodies; DC stored locally, no long cables. Target: Ciel & Terre (FR), BayWa r.e. (DE), Sungrow Floating
13	Agri-PV / solar greenhouses	Legal red line: no concrete bases on farmland; big cabinets take growing area, heat crops, fire risk	Zero new land; hang on steel frame / high-rail back; avoids land-agency review. Target: NextEnergy Capital (UK), Enel Green Power (IT), ORIX / SB Energy (JP)
14	Dense urban old commercial complexes & hospitals	No outdoor space; basement/plant-room fire approval nearly always rejected for large centralized Li-ion in crowded buildings	Outdoor dispersed under-roof; tiny unit capacity below strict fire threshold; non-cascading. Target: CBRE / JLL sustainability, multinational hospital groups
15	Linear transport BIPV (noise barriers / rail-side PV)	Noodle-like, tens of km long; central storage would need land every 1–2 km; low-voltage DC over km cables suffers huge line loss/voltage drop	Rods with panels on barriers/rails; local DC bus feeds cameras, ETC gantries, tunnel lighting. Target: transport SOE / ministry (e.g. ASFINAG), smart-mobility integrators
16	Cold-chain fleets & long-haul heavy trucks	Rooftop flexible PV for reefer/compressor or parking A/C; cabinets too heavy for payload;	Dispersed light modules under rooftop PV; 24/48 V DC direct, zero inversion loss. Target: Thermo King, Carrier

		centralized cells damaged/ignite on rough roads	Transicold; Wabash, Schmitz Cargobull
17	Border/coastal surveillance & remote weather/geology IoT	No roads; phased-array radar/IR cameras/weather stations on 4000 m cliffs; can't carry heavy cabinets/inverters	Modular 'bricks' carried in backpacks; portable PV + rods; Mesh keeps others powered if one is hit. Target: Thales, Hikvision overseas, off-grid architects, defense infrastructure managers
18	Smart-city furniture: bus stops, digital OOH, smart light poles	Hard to connect power; digging sidewalks costly/restricted; bulky solar+battery boxes ugly, vandal-prone, block tactile paving	No trenching; thin module hidden behind roof/screen; DC to LCD/5G router. Target: JCDecaux, Clear Channel, Lamar; smart-pole/security integrators
19	LEO satellite off-grid terminals (Starlink/OneWeb)	No grid in remote farms/RVs; farmers won't install inverter+big box; logistics cost exceeds equipment	Plug-and-play DC micro-storage paired with panels; 0 inverter, 0 electrician. Target: regional satellite distributors (Paratus, Viasat agents), RV converters
20	Ocean fishing boats, yachts, inland barges	Weight-sensitive; zero tolerance for salt-spray corrosion and inextinguishable fire; vessel DC microgrid 12/24/48 V	Light rods under rooftop flexible PV; IP-rated, no cabin space; single fault doesn't affect vessel. Target: Victron Energy, Mastervolt, Garmin Marine; Sunreef, Fountaine Pajot

11. Competitive Landscape & Differentiation

Thousands of firms make storage cabinets and many make optimizers, but very few can deliver the cross-domain integrated engineering of an MLPE + storage, panel-under DC micro-storage rod (MPPT + shutdown + 3.2 kWh in one unit). Fewer than 3–5 companies globally mass-produce it today.

11.1 Competitive ecosystem by camp

Camp	Representative players	Their strength	Our differentiation	Our gap / risk
Utility container BESS	Tesla Megapack, Fluence, Sungrow, CATL, BYD, HyperStrong, Envision, ATS, Trina, Jinko, Narada, Kehua, Sinexcel	Scale cost, mature liquid cooling, grid dispatch, brand	Zero land, fast install, DC coupling, retrofit without shutdown, movable, phased purchase	Higher per-kWh cost; hard to win big tenders head-on
String / C&I; storage	Huawei Smart String ESS, Sungrow PowerTitan, Tesla Powerwall, Enphase IQ Battery, SolarEdge Home, FranklinWH, sonnen, Pylontech, BYD Battery-Box,	Mature residential/C&I; channel, complete certification	Component-level, under-panel mount, wireless Mesh, 48 V direct, old-plant retrofit	Weak channel, certification, after-sales network

	GoodWe, Growatt, Deye, Sol-Ark, Volt-Ampere			
Component-level power electronics	SolarEdge, Enphase, Tigo, APsystems, Hoymiles, APsystems, Deye	Mature optimizer/microinverter/RSD, large installed base	We add storage on top, not just an optimizer	They can integrate a battery and compete
Direct look-alike	Yotta Energy SolarLEAF (US) — closest under-panel module storage	Early concept proof, entered C&I; rooftop	We address larger scenes: existing plants, towers, off-grid, local assembly	Study Yotta's commercial lessons: cost, certification, maintenance, channel
Telecom 48 V storage	Huawei, ZTE, Vertiv, Eaton, Schneider, Delta, Shuangdeng, Narada, Hytera, BYD, Zhongtian	Mature 48 V DC, operator procurement system	PV+storage+optimizer integrated; fits weak/no-power towers	Long operator certification cycle, price-sensitive
Mounting / trackers	Nextracker, Array, GameChange, Arctech, Trina Tracker, FTC, PVH	Mounting channel, plant customers	Can cooperate on mounting, not necessarily enemies	Load, wind-vibration, electrical safety need certification

11.2 Who to benchmark

• Yotta Energy (US) — primary direct look-alike: SolarLEAF disperses cells under PV panels; closest form factor. Verify its per-panel MPPT, DC output, wireless network and large existing-plant retrofit capability item by item; do not assume it is identical. Study its commercial hardships (cost, certification, maintenance, channel).

• SolarEdge (Israel/US) — most dangerous potential giant: component optimizer + DC-coupled battery + EMS; fullest tech stack; could launch module-level storage quickly.

• Enphase (US): microinverter + AC battery, strong component-level power electronics, but AC architecture, not under-panel DC.

• Chinese players to watch: Hoymiles, APsystems, Deye (microinverter/optimizer DNA); GoodWe, Growatt follow.

Screening standard for a 'real' competitor: component MPPT/optimizer + cell/BMS + DC/DC + wireless/EMS + rail mount + safe shutdown + certification/channel. Ask any claimant for five proofs: rod model & datasheet, under-mount project photo & address, continuous-run data, safety test report, fault-replacement & inverter-compatibility plan.

11.3 Differentiation wall (why the gap holds)

• The moat is not the cell itself but the whole software-hardware architecture: under-panel mount + independent per-rod wireless Mesh + per-panel fine charge/discharge + dispersed fire control + removable/reusable + SKD local-assembly subsidy + as-needed pilot purchase.

• Large makers ignore this fragmented niche (too small vs container storage); small makers can only build battery hardware, not the full dispatch software.

• No mainstream vendor offers an under-PV mounted individual storage rod with per-panel wireless charge/discharge control and modular knock-down assembly for local subsidy qualification.

11.4 Ready-to-use comparison line for outreach letters

“Conventional BESS (container/cabinet) needs extra land and heavy civil work. No mainstream manufacturer offers under-PV mounted individual storage rod with per-panel wireless charge/discharge control, modular knock-down assembly for local subsidy qualification.”

11.5 Go-to-market competitive playbook

• Certification first: without UL/CE/IEC/Australian CEC, overseas sales stay pilot-only, not scale.

• Scene focus: start with telecom towers + existing-PV retrofit + off-grid mines/islands; do not spread everywhere at once.

• Channels: tower O&M, EPC, mounting makers, PCS/combiner, local assemblers, insurers.

• Business models: pilot 10–100 rods; EMC, leasing, capacity leasing, VPP aggregation; component export + local assembly.

• Technical validation: heat/dust, salt spray, vibration, wireless anti-interference, fire, cycle life, recycling.

• Pricing logic: compare against diesel LCOE, centralized storage + land + grid-connection cost, peak-valley arbitrage — never just cell unit price.

12. Reference Case: 100 MW Northwest Retrofit & Feasibility Study

12.1 Live deployment — 100 MW old-plant retrofit (Northwest China)

A real retrofit of an existing large PV station in Northwest China: the micro-storage rods are hung under the module mounting rail beside the panels, with no extra land, retaining the original inverter and cabling. Site photos and the client exchange are preserved below.



Live site: rods mounted under the PV rail on a sandy, large-scale ground-mount station (100 MW retrofit).

Client exchange (Aaron): “This is a retrofit of an old PV station in Northwest China” / “Yes, this is a 100 MW PV-storage retrofit.” Five on-site photos attached.



Close-up of a single rod: cooling fins, wireless antenna, red/black/green cabling under the panel.



Row of rods under the array; wireless antenna/communication module circled.

Wireless communication note: simple installation; no separate cabling between modules — only connected in series with the panel string; antenna circled on site.

12.2 Feasibility study: curtailment analysis & storage sizing (3 stations, 2024–2026)

Scope: Phase 1 (20 MW), Phase 2 (50 MW), Phase 3 (30 MW); full-year 2024, full-year 2025, and 1 Jan–16 Jul 2026. Purpose: characterize curtailment (curtailed solar) and size storage for absorbing curtailment and raising delivered energy. Prepared July 2026.

Annual overview

Metric (2024 / 2025 / 2026*)	Phase 1 (20 MW)	Phase 2 (50 MW)	Phase 3 (30 MW)
Curtailment-day share	80.3% / 92.3% / 95.9%	79.5% / 92.1% / 94.4%	74.3% / 92.3% / 95.9%
Annual curtailed energy (10k kWh)	556.3 / 1282.1 / 722.9	1669.9 / 3202.4 / 1958.0	860.2 / 1792.1 / 1103.7
Peak single-day curtailment (10k kWh)	9.33 / 17.41 / 8.98	19.09 / 27.72 / 24.26	13.59 / 15.81 / 13.95

Combined annual curtailed energy doubled from 30.86 GWh (2024) to 62.77 GWh (2025); H1-2026 already reached 37.85 GWh. Frequency rose from 74–80% of days in 2024 to 94–96% in H1-2026 — approaching 'curtailed every day'. Phase 2 curtailment is 2.5–3× Phase 1, matching its size; the three stations share a synchronized daily rhythm, confirming grid-side dispatch.

Intra-day & monthly pattern

- Typical window is midday peak generation (11:00–16:00 core; 90–98% of curtailed days); window widened from 10:00–16:00 (2024) to ~9:30–17:30 (2026).
- Average chargeable window 6–7 h, supporting 2 h+ storage full charge within the window; median start moved earlier, end later.
- Monthly rhythm identical across stations: peaks in spring (Mar–May) and early autumn (Sep); light in summer flood season and winter (Dec–Jan).
- Curtailment-day share filled the valley: 65–90% (2024) → 90–100% most months (2025) → near 100% every month (H1-2026).

54-configuration daily charge/discharge simulation

For each station: 9 power ratios (20%–60%, step 5%) × 2 durations (2 h / 4 h) = 18 cases; 54 cases total. Assumptions: SOC window 10%–95% (usable = 85% of rated); daily charge = min(daily curtailment, usable capacity); discharge = charge × 90%; one charge-discharge cycle per day; curtailment absorption = annual charge / annual curtailment; delivery ratio = (raw generation + storage discharge) / (raw generation + raw curtailment); no-storage baseline delivery: P1 61.4%, P2 60.1%, P3 61.6%.

Finding	Detail
Annual discharge grows monotonically with capacity	P1 2.05 GWh (4 MW·2h) -> 8.95 GWh (12 MW·4h); P2 5.03 -> 23.09 GWh; P3 3.11 -> 13.71 GWh
4 h beats 2 h significantly	At same ratio, 4-h annual discharge = 1.6–1.9x 2-h; 6–7 h charge window lets long-duration storage eat full curtailment
Diminishing returns at high ratio	Max-case absorption: P1 79.1%, P3 79.4%, P2 77.0% (none reach 100%); storage capacity remains the binding constraint
Delivery-ratio uplift	P1 67.7%->88.9% (+27.5 pt); P3 67.8%->89.0% (+27.4 pt); P2

	66.2%->87.7% (+27.6 pt); 4-h uplift ~1.9x 2-h
Utilization vs absorption trade-off	Small/2-h utilization 82–93%; at 60%·4-h it falls to 66.8% / 68.2% / 68.9% (~1/3 usable idle); balance absorption against utilization

Recommended sizing

- At 85% delivery-ratio target: P1 needs 9 MW·4h; P2 needs 25 MW·4h; P3 needs 13.5 MW·4h.
- Balancing delivery and utilization: P1 recommend 7.0 MW·4h (35% ratio); P2 recommend 20 MW·4h (40% ratio); P3 recommend 10.5 MW·4h (35% ratio).

13. Pilot Roadmap, Commercial Entry & Buyer FAQ

13.1 Recommended commercial entry sequence

Phase	Focus	Actions
Stage 1 — domestic Northwest proof	100 MW-class old-plant retrofit (Inner Mongolia, Xinjiang, Gansu, Qinghai, Ningxia, N. Shanxi, N. Hebei)	Run a 1–5 MW validation zone; collect 6+ months run data; compare against un-retrofitted area; prove yield gain, storage efficiency, O&M; cost.
Stage 2 — telecom towers	China Tower; Africa/India/South Africa towers; Middle-East remote sites	Standard package: 48 V version, 3.2 kWh class, PV input, tower load output, remote monitoring, diesel linkage, anti-theft/tamper, local wireless.
Stage 3 — India, South Africa, Australia, Middle East	Choose local partners: PV EPC, telecom-energy providers, inverter dealers, storage integrators, local assemblers, O&M; firms	Do not set up an independent sales team in every country at first; use one well-resourced local partner for a reference project.

13.2 Sales-ready evidence pack to build

- Continuous run data from a 1 MW+ real project; before/after generation comparison.
- Charge/discharge efficiency test; per-panel MPPT gain test; yield data under different shading ratios.
- Investment comparison vs centralized storage and vs string storage.
- Wireless packet-loss, latency and coverage distance; extreme high-temperature run data; module back-sheet temperature-rise test.
- Rack load-bearing & wind-load report; single-point thermal-runaway and fault-isolation test; EMC and lightning-protection test.
- Field installation labor-time statistics; disassembly and relocation case; overseas local-assembly BOM and process files.
- Insurer-accepted fire & safety documents; detailed project revenue model template.

13.3 Key questions buyers will ask (prepare complete answers)

Topic	Questions to answer

Battery & safety	Cell brand/model; LFP or other; per-rod capacity & rated power; max operating temperature; IEC 62619 / IEC 63056 / UN38.3; UL9540A or equivalent thermal-runaway test; does one rod fault affect neighbors; fire suppression; does under-mount raise back-sheet temperature?
Electrical compatibility	Compatible with Huawei, Sungrow, SMA, Sungrow, Power Electronics inverters; DC voltage range; max short-circuit current; per-panel power range; can connect to existing strings; does retrofit need shutdown; bypass on fault; does system run if wireless drops?
Mechanical & environmental	Rack load capacity; wind/snow load calculation; heat, dust, salt-spray, humidity suitability; IP65/IP66; does under-mount block ventilation; hot-spot/back-sheet aging; device life vs module life match.
O&M; & commercial	Warranty years; degradation warranty definition; local spares; how to swap one rod; max wireless nodes; where is the 30,000-device case; run duration offline; does EMS support local tariff/grid rules; project payback.

13.4 Markets to avoid early on

• Do not enter residential storage head-on: SolarEdge, Enphase, Tesla, Huawei, Sungrow brands are mature; installer network complex; small ticket; high after-sales/warranty cost; households are brand- and safety-sensitive.

• Do not compete directly on large grid-side storage: cell scale, system integration, bank financing acceptance, grid test, fire system, EPC resources, large-project insurance, supply-chain scale are not yet our strengths.

• Do not pitch '365-day power sales' as a global universal selling point: grid limits, negative prices, peak-valley tariffs, sales licenses, curtailment rules, reverse-feed limits and market rules differ. Better: 'use storage + EMS to extend dispatchable generation hours and raise saleable energy and self-consumption.'

13.5 Final judgment

There is a market, but it is a structural niche rather than a mass market for every PV system. The most likely first buyers: telecom tower operators, existing-PV owners/IPPs, off-grid miners, island microgrids, constrained C&I, EPC/local assemblers. Most priority countries: USA, Australia, Germany/Italy/Spain, India, South Africa, Philippines/Indonesia, Saudi/UAE, Brazil/Chile, China. Most priority scenes: existing-PV retrofit, telecom 48 V DC, weak/off-grid, high-tariff peak-valley, local-assembly subsidy, component-level safety compliance. If certification passes, cost matches diesel/centralized add-storage, wireless reliability is proven, and local assembly + after-sales are built, real procurement follows in these segments; otherwise it stays 'good concept, many pilots, hard to scale.'

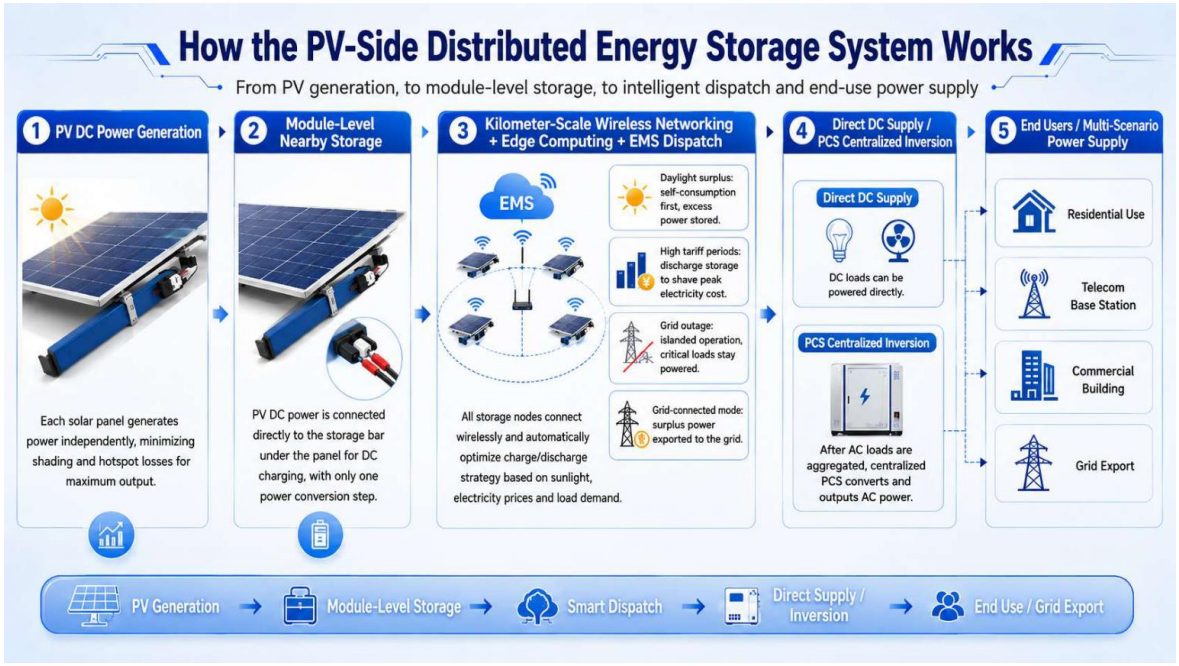
14. Photo & Screenshot Gallery (All Source Images)

This appendix collects every source image supplied: English deck pages, Chinese deck diagrams, site photos, WeChat client exchanges and internal BD screenshots, so nothing is omitted from the pack.

14.1 English product deck pages (full set)



English deck page 1



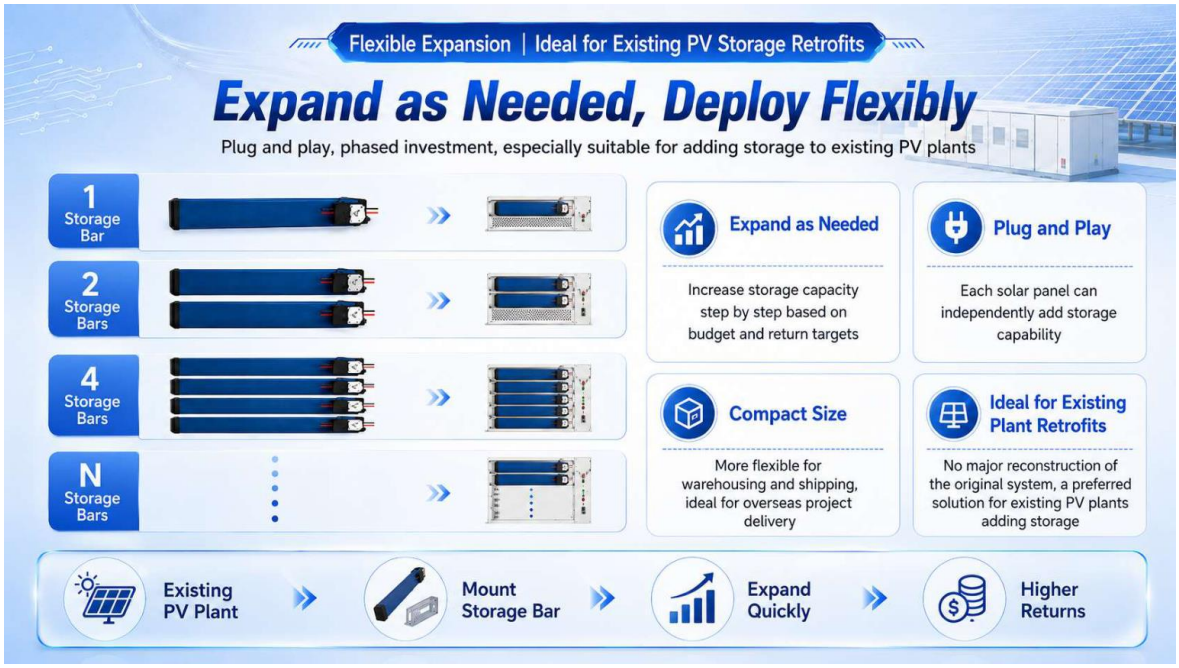
English deck page 2



English deck page 3



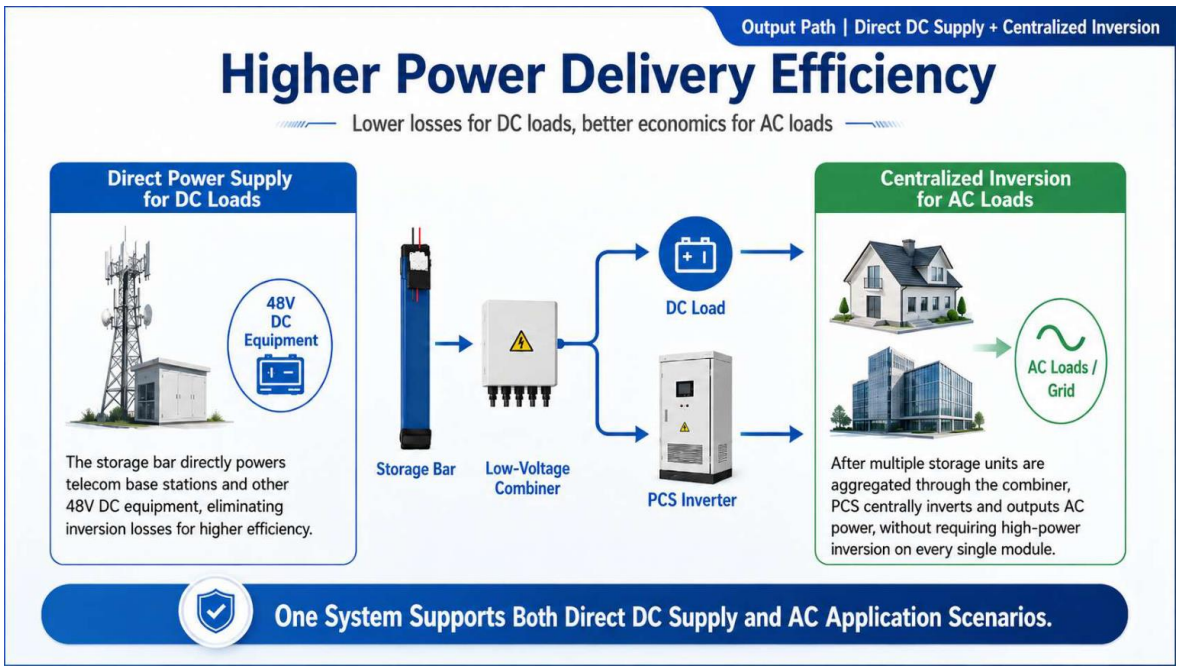
English deck page 4



English deck page 5



English deck page 6



English deck page 7



English deck page 8



English deck page 9



English deck page 10



English deck page 11

14.2 Supplementary screenshots & client exchanges

Selling points: per-panel independent wireless control; dispersed fire-risk control.

Duplicate screenshot of the same selling-points slide (retained for completeness).

WeChat: old Northwest PV station retrofit; 100 MW PV-storage retrofit; XINJIANG MW-SCALE GROUND-MOUNT.

Six core selling points on a mobile screenshot.

Differentiation barrier and ready-to-use English comparison talk track; risk reminder.

Wireless antenna explanation: simple install; no inter-module cabling; series with panel string.

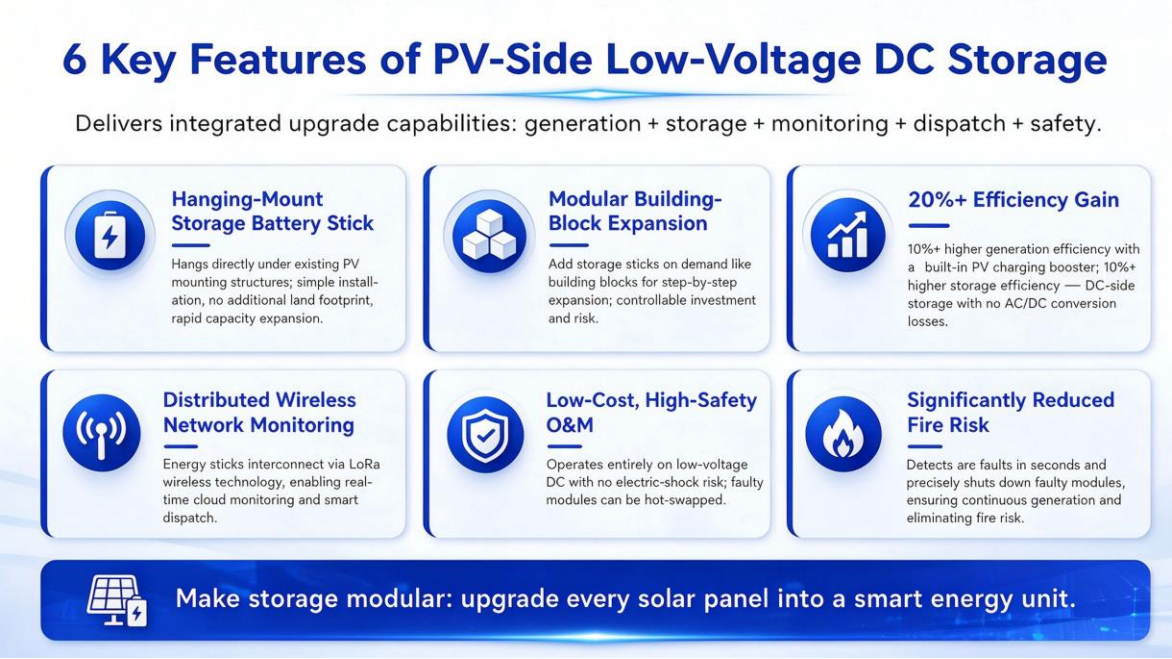
Long-form internal BD guide: how to find mines/EPC, search keywords, target roles.

Long-form target-customer tiers by deal closeness.

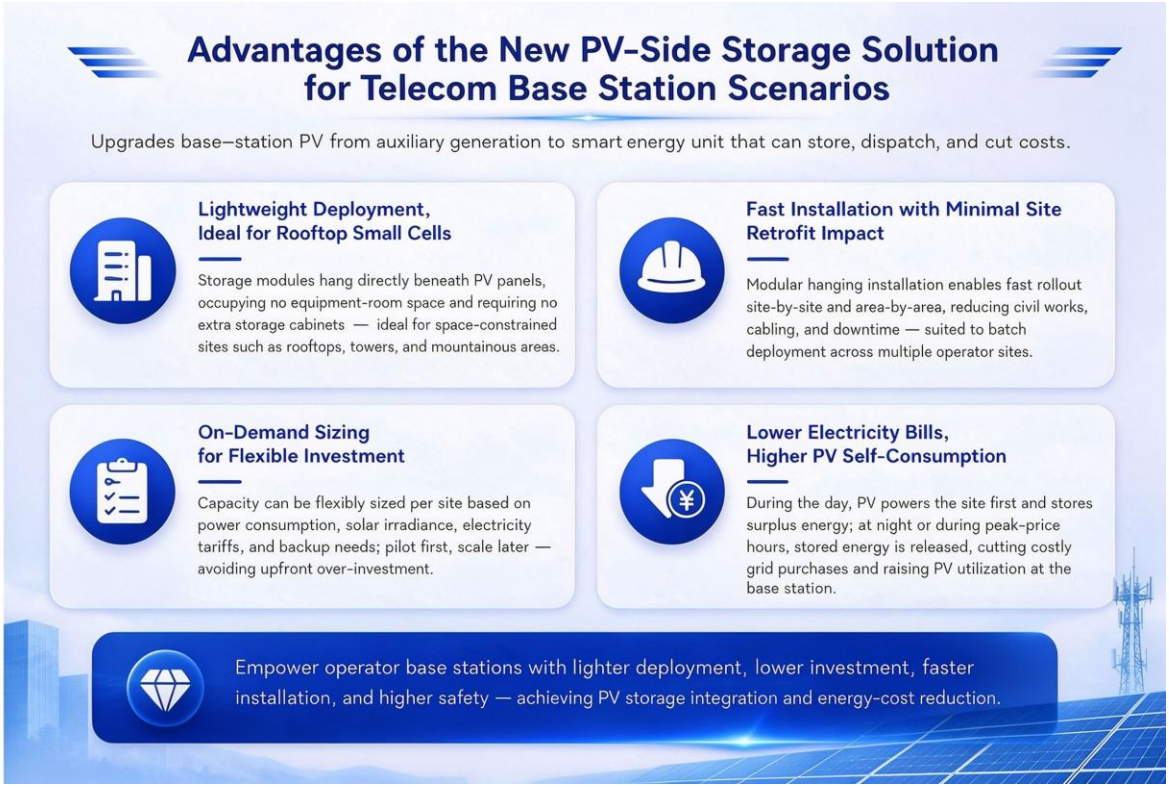
14.3 Supplementary Chinese-deck diagrams & additional site photo



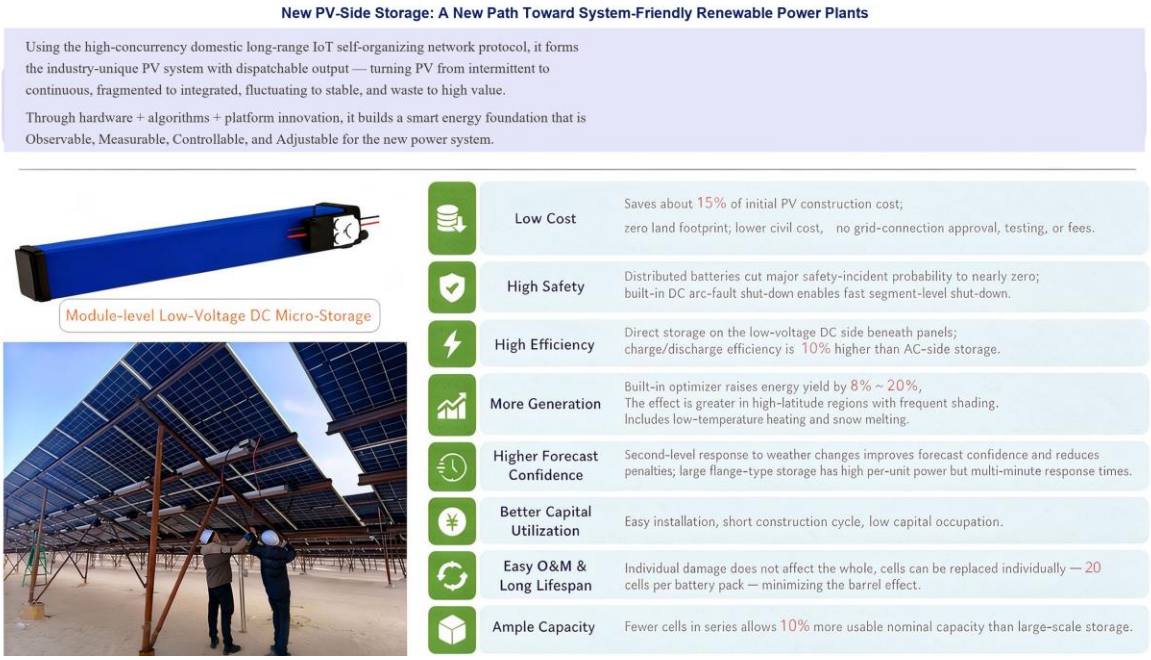
Technology strength: domestic first-of-kind, internationally leading; deep cooperation with a national key grid-equipment lab; solves the uncontrollable-generation problem; proven at MW-class stations in Xinjiang, Qinghai and Nanjing.



Six features of PV-side low-voltage DC storage: hung battery rod; block-by-block scaling; 20%+ efficiency gain; distributed wireless mesh monitoring; low-cost high-safety O&M; sharply reduced fire risk.



Advantages for operator base-station scenarios: lightweight rooftop/small-site deployment; fast, low-impact retrofitting; pay-as-needed flexible investment; lower electricity bill and higher PV self-consumption.



Component-level low-voltage DC micro-storage: system-friendly new-energy station path — low cost (15% lower initial PV cost, zero land, no grid-approval), high safety (dispersed cells, DC-arc segmented shutdown), high efficiency (+10% charge/discharge vs AC side), more energy (+8%–20% via optimizer), second-level response, easy O&M, 10% more usable capacity.



Additional site view: rows of rods mounted under the rail; wireless communication module/antenna circled; red/black/green string cabling visible.