



TBEA Profile and Renewable Energy Solutions

TBEA Europe
May, 2024



PART 1

Who We Are?

- Introduction to TBEA Group

Core Business of TBEA Group



TBEA 特变电工



Power Transmission & Distribution Industry

TBEA's T&D industry has covered five major types of products and services: transformers, wires & cables, HV switch, supporting components and EPC contracting. Its annual production capacity of transformers is 266 million kVA, Ranking Top1 in the world.



Traditional energy

TBEA has established a complete coal industry chain, including large-scale open-pit coal mining, coal-electricity integrated industry and coal chemical industry.



New Material Industry

TBEA fabricates deep-processing aluminum products such as high purity aluminum, electronic aluminum foil, electrode foil with independent patents. The products are widely applied to aerospace, heavy industry, IT and other fields. Ranking Top1 in China.



Renewable Energy Industry

TBEA has established a complete PV industry chain including poly-silicon, wafer, solar inverter, statcom and integrated solutions.

TBEA has constructed more than 5200 on-grid solar/wind plants with installed capacity of more than 25GW in China, Ranking TOP1 three years in a row..

Financial Statistics of 2023:

1. Sales Revenue: 14.01Billion euros;
2. Net Profit: 2.02billion Euros;
3. Cash flow: 3.68billion Euros.

3 stocklisted company in Power Transmission and Distribution, Renewable Energy and New material

Domestic & Foreign Industrial Parks



TBEA 特变电工



HQ Science & Technology R&D Center



TBEA International Engineering Contracting Company (Beijing)



Xiong'an Technology Company (Hebei)



The Northwest Industrial Park



The Northeast Industrial Park (Liaoning)



The Southern China Industrial Park (Hunan)



The Northern China Industrial Park (Tianjin)



Shanghai EHV Electrical Science and Technology Industrial Park (Shanghai)



The Eastern China Industrial Park (Shandong)



The Southwest Industrial Park (Sichuan)



TBEA Intelligent Electrical Industrial Park



Nanjing Intelligent Electrical Industrial Park (Jiangsu)



New Energy Industrial Park



Poli-silicon Industrial Park



Xi'an Electrical Science and Technology Industrial Park (Shannxi)



Joinworld New Material Industrial Park



Zhundong Coal Power Energy Base



Zhongjiang Changji International Logistics Park



India 765kV EHV Power T&D Hi-tech Industrial Park



Tajikistan Energy Company



PART 2

What TBEA Xi'an do?

– TBEA Renewable Energy Solutions



TBEA Xi'an Electric Technology Co., Ltd.

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TBEA Xi'an Electric Technology Co., Ltd is the wholly owned subsidiary of TBEA group, as the main body of TBEA renewable energy equipments supplier and services provider, TBEA Xi'an is dedicated to the R&D, manufacturing, sales and services of solar inverter solutions (with totally more than **64GW** installation worldwide, BESS (over 4GWh installed), Micro-grid, Statcom (with more than **35GVar** installation worldwide), SCADA and TB-eCloud smart O&M platform.



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装备中国 装备世界



TBEA Xi'an Renewable Energy Industrial Park

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TBEA Xi'an renewable energy industrial park, the total investment is **4.3billion RMB**(equal to 614.285M Euros)

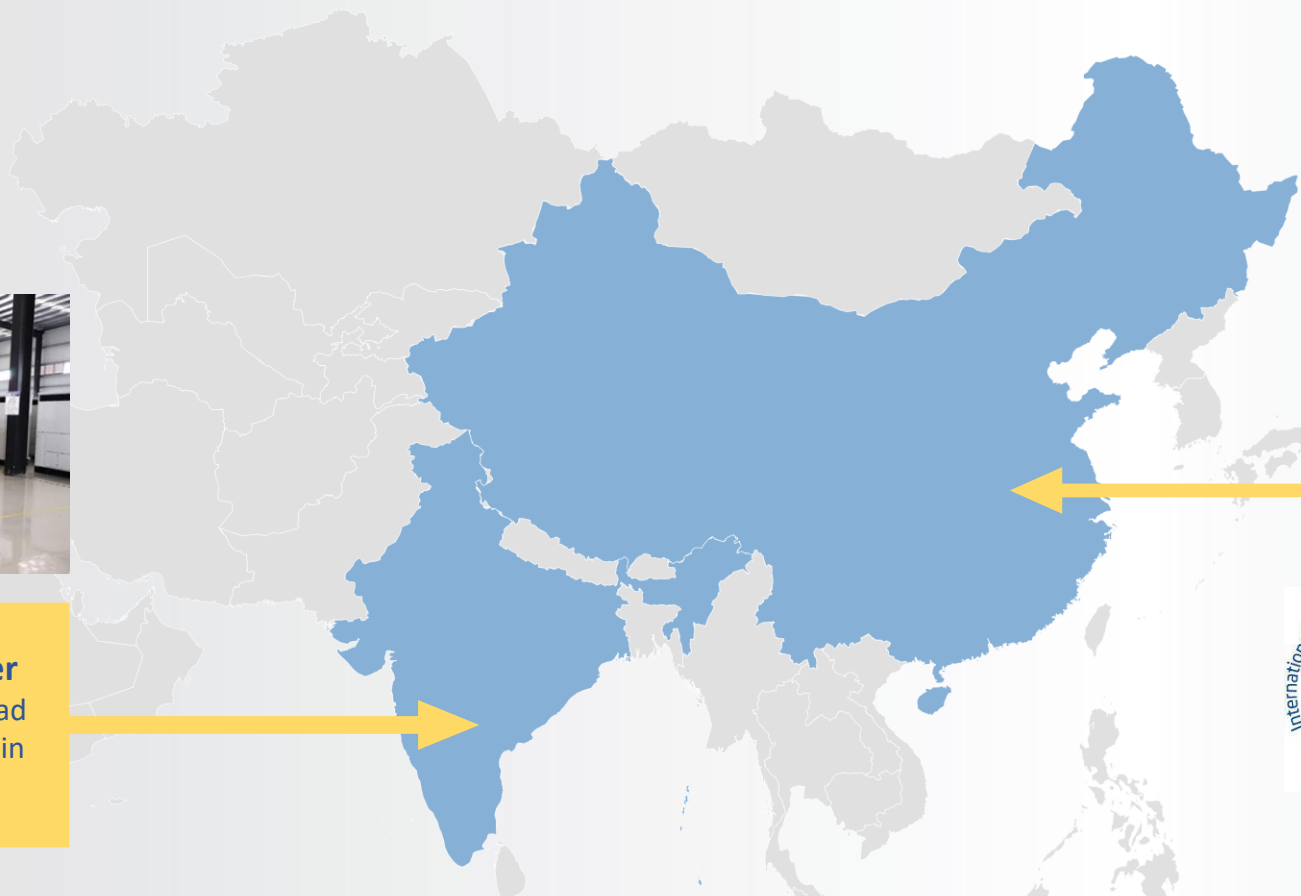


Manufacturing Capability (40GW)

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TBEA India Inverter
factory in Bangalore had
come into production in
2019. (5GW/year)



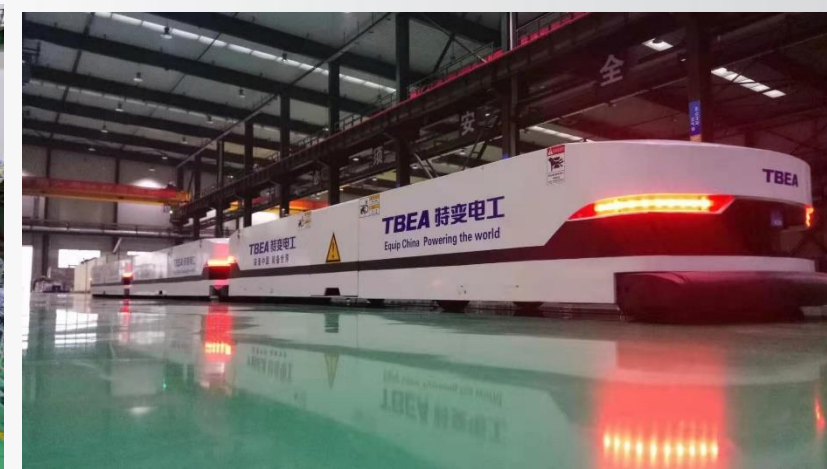
TBEA Xi'an Industrial Park 306,000 m²,
which 8,000 m² are allocated to inverters
(35GW/year)



Industrialization and adaptation of four TBEA digitalized MV transformer manufacturers to IEC standards to supply full TBEA solution with inverters and transformers in-house... meanwhile, we also count with other best partners from China for MV stations

Manufacturing Facility in Xi'an Headquarter, China(35GW)

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- ✓ Postdoctoral Workstation for basic scientific research and product R&D
- ✓ National Level Lab cooperating with TOP level universities
- ✓ The most advanced automatic production line for string inverter



Manufacturing Facility in Bangalore, India(5GW)

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- ✓ Manufacturing both Central and String Inverter
- ✓ Supply for Globally market





PART 3

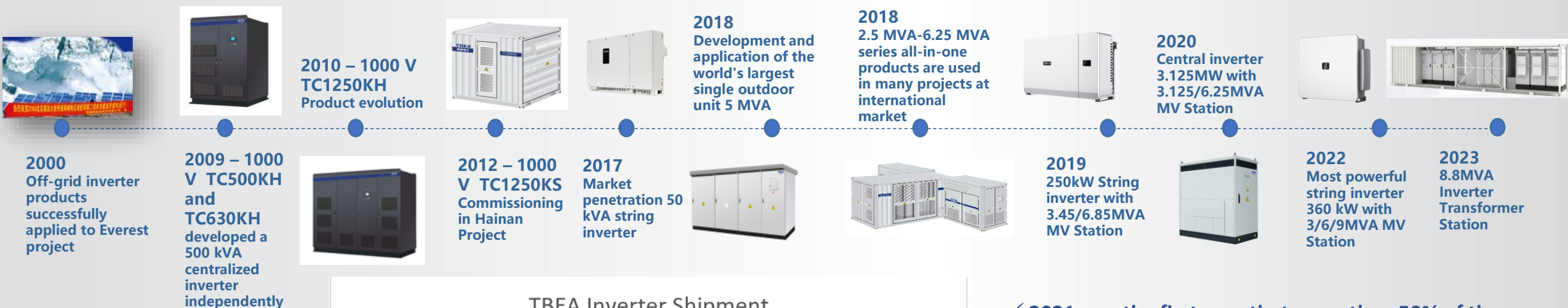
What Do We Have?

– Product Portfolio



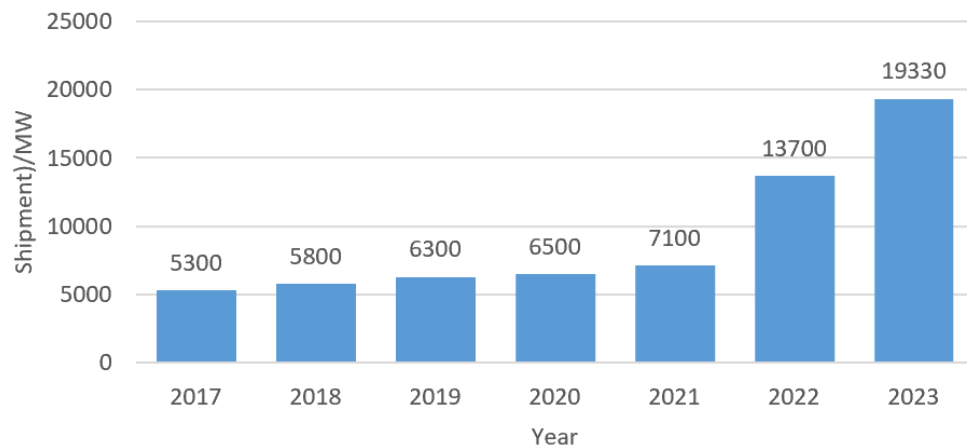
Product Portfolio (String and Central inverter)

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23GW already signed, totally 35GW shipment is expected in 2024!

TBEA Inverter Shipment in Global Large Scale Utility Project



- ✓ 2021 was the first year that more than 50% of the shipments were with string inverter
- ✓ TBEA C&I inverter yearly shipment exceeded 2GW in 2023
- ✓ TBEA 75~110kW C&I inverters are available with Spain, Italy, Poland, Netherlands, Greece local grid certificates from May, 2024
- ✓ TBEA 3~60kW inverters with Spain, Italy, Poland, Netherlands, Greece local grid certificates from July, 2024



Product Portfolio-String Inverter -TS250KTL-HV-C1 and MV Station



MV Station: TS3450KT, TS6850KT

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Model	TS250KTL-HV
Efficiency	
Max. Efficiency	99%
European Efficiency	98.7%
Input(DC)	
Max. Input Voltage	1500V
Max. Input Current per MPPT	30A/40A
Max. Short Circuit Current per MPPT	50A
MPPT Voltage Range	500V~1500V
Number of Inputs	24/18
Number of MPP Trackers	12/9
Output(AC)	
Output Power	250kW@30°C/228kW@40°C/208kW@50°C
Max. Output Apparent Power	250kVA
Max. Output Active Power (cosφ=1)	250kW
Nominal Output Voltage	800V/3W+PE
Nominal Output Frequency	50Hz/60Hz
Nominal Output Current	165A
Max. Output Current	180A
Adjustable Power Factor Range	0.8(leading)~0.8(lagging)
Max. Harmonic Content	<3%In
Protection	
Input DC Switch	Support
Anti-islanding Protection	Support
AC Overcurrent Protection	Support
DC Reverse-Polarity Protection	Support
String Fault Detection	Support
DC Surge Protection	Type II
AC Surge Protection	Type II
DC Insulation Impedance Detection	Support
Residual Current Detection Display	Support
Display and Communication	
Display	LED WIFI+APP
RS485 PLC	Support
Wi-Fi	Support
General Parameters	
Dimensions (W x H x D)	1100mm*700mm*360mm
Weight	110kg
Operating Temperature Range	-25°C~60°C
Cooling Method	Smart Forced Air Cooling
Max. Operating Altitude	5000m
Relative Humidity Range	0%~100%
DC Connector	MC4 EVO2
AC Connector	OT/DT Terminal
Protection Degree	IP66
Topology	Transformerless
Standard Compliance	
Compliance	IEC 62109-1/-2, EN 50530, IEC 62116, IEC 62910, IEC 60068, IEC 61683, CFA2019



Product Portfolio-String Inverter -TS360KTL-HV-C1 and MV Station



MV Station: TS3000KT, TS6000KT, TS9000KT

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Model	TS360KTL-HV-C1
Efficiency	
Max. efficiency	99.02%
European efficiency	98.8%
Input (DC)	
Max. input voltage	1500V
Max. input current per MPPT	65A
Max. short-circuit current per MPPT	115A
MPPT voltage range	500V ~ 1500V
Number of inputs	24 / 30
Number of MPP trackers	6
Output (AC)	
Output power	363kW @30°C / 330kW @40°C / 300kW @50°C
Max. output apparent power	363kVA
Max. output active power (cosΦ=1)	363kW
Nominal output voltage	800V / 3W+PE
Nominal output frequency	50Hz / 60Hz
Max. output current	262A
Adjustable power factor range	0.8 (leading) ~ 0.8 (lagging)
Max. total harmonic distortion	<3% (at nominal power)
Protection	
Input DC switch	Support
Anti-islanding protection	Support
AC overcurrent protection	Support
DC reverse-polarity protection	Support
String fault detection	Support
DC surge protection	Type II
AC surge protection	Type II
Insulation monitoring	Support
Residual current detection display	Support
Display and Communication	
Display	LED, WLAN+APP
Communication	RS485 PLC
General Data	
Dimensions (W × H × D)	1120 × 820 × 365mm
Weight	110kg
Operating temperature range	-25°C ~ 60°C
Cooling method	Smart forced air cooling
Max. operating altitude	5000m (>4000m derating)
Relative humidity range	0% ~ 100%
DC connector	MC4 Evo2
AC connector	OT / DT Terminal
Degree of protection	IP66
Topology	Transformerless
Standard Compliance	
Compliance	IEC 62109-1/-2, EN 50530, IEC 62116, IEC 62910, IEC 60068, IEC 61683, CEA2019



Product Portfolio-Central Inverter Transformer Station

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TC4400KT Inverter Transformer Station

Model	TC4400KT-6
Efficiency	
Max. efficiency	99%
European efficiency	98.7%
Input (DC)	
Max. input voltage	1500V
Min. Input voltage/Start-up voltage	900V
MPPT voltage range for nominal power	900V ~ 1300V
Number of MPPT trackers	3
Number of inputs	18 / 21 / 24
Max. input current	3 × 1913A
Output (AC)	
Nominal output power	4400kW @40℃
Max. output power	5060kW @20℃
Nominal output voltage	10 ~ 35kV
Nominal output frequency	50 / 60Hz
Max. total harmonic distortion	< 3%(at nominal power)
DC current injection	< 0.5%In
Power factor at nominal power	0.99
Adjustable power factor range	0.8 (leading) ~ 0.8 (lagging) , continuously adjustable
Protection	
AC/DC overvoltage protection	Yes
AC/DC overcurrent protection	Yes
AC/DC overlightning protection	Yes
Overheat protection	Yes
Grid monitoring	Yes
Grounding fault monitoring	Yes
Insulation monitoring	Yes
Other Functions	
PID protection and renovation	Optional
SVG function	Optional
BESS interface	Optional
IEC61850 Communication protocol adapter	Optional
General Data	
Dimension (W×H×D)	6058×2896×2438 mm
Weight	≤17.5T
Inverter protection degree	IP65 (standard) / IP55 (optional)
Auxiliary power	5KVA
Operating ambient temperature range	-35 ~ 60℃ (> 40℃derating)
Operating relative humidity range	4% ~ 100%, no condensing
Cooling method	Smart forced air cooling
Max. operating altitude	2000m (standard) / 2000m (optional)
Communication	RS485 / Ethernet
Standard Compliance	
Compliance	IEC 62109-1, IEC 62109-2, IEC 61727, IEC 62116, GB/T 37408, GB/T 19964, NB/T 32004, Q/GDW 1617, CGC/GF 035-2013



Product Portfolio-Central Inverter Transformer Station

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TC8800KT Inverter Transformer Station

Model	TC8800KT-EL-61	TC8800KT-EL-60
	Efficiency	
Max. efficiency	99%	
European efficiency	98.7%	
	Input (DC)	
Max. input voltage	1500V	
Min. Input voltage/Start-up voltage	938V	900V
MPPT voltage range	938V ~ 1500V	900V ~ 1500V
MPPT voltage range for nominal power	938V ~ 1300V	900V ~ 1300V
Number of MPP trackers	6	
Number of inputs	36 / 42 / 48	
Max. input current	6 × 1915A (@938V DC/20℃)	6 × 1913A (@900V DC/20℃)
	Output (AC)	
Nominal output power	8800kW @50℃	8800kW @40℃
Max. output power	10560kW @20℃	10120kW @20℃
Nominal output voltage	20 ~ 35kV	20 ~ 35kV
Nominal output frequency	50 / 60Hz	
Max. total harmonic distortion	<3% (at nominal power)	
DC current injection	<0.5%In	
Power factor at nominal power	0.99	
Adjustable power factor range	0.8 (leading) ~0.8 (lagging) , continuously adjustable	
	Protection	
AC/DC overvoltage protection	Yes	
AC/DC overcurrent protection	Yes	
AC/DC overlightning protection	Yes	
Overheat protection	Yes	
Grid monitoring	Yes	
Grounding fault monitoring	Yes	
Insulation monitoring	Yes	
	Other Functions	
PID protection and renovation	Optional	
SVG function	Optional	
BESS interface	Optional	
	General Data	
Dimension (W × H × D)	12192 × 2438 × 2896 mm	
Weight	≤32T	
Inverter protection degree	IP65 (standard) / IP55 (optional)	
Auxiliary power	5KVA	
Operating ambient temperature range	-35 ~ 60℃ (>50℃ derating)	-35 ~ 60℃ (>40℃ derating)
Operating relative humidity range	4% ~ 100% , no condensing	

The BESS is mainly in the form of System Solutions



liquid cooling battery container :

- 4.073MWh (306Ah, 0.5C, 0.25C, not 1C)
- Brand: CATL
- Time: After 2024.5.1



1500Vdc PCS& Transformer all-in-one System:

- 2.5MW/3MW/3.45MW PCS and transformer(Oil-immersed) all-in-one(Single module 1.25/1.5/1.725MW), PCS Output voltage 690V
- Brand: KeHua
- Time: After 2024.5.1
- Feature: Off-grid, black start

Battery container and centralized PCS all-in-one machine, form 2.5MW/4.073MWh(2h), 1.25MW/4.073MWh(4h), 2.5MW/8.146MWh(4h), or other else energy storage unit. Support black start, off-grid.

Advantages: ultimate safety, High reliability ,good grid , Low initial cost

Application: Front of-the-meter: Colocated with solar/ wind/hybrids/conventional, Standalone

Excluding behind-the -meter: Residential, Commercial(preventing sudden power outages
achieving electricity cost reduction through peak valley price arbitrage)

The BESS is mainly in the form of System Solutions



liquid cooling battery container :

- 4.073MWh (306Ah, 0.5C, 0.25C, not 1C)
- Brand: CATL
- Time: After 2024.5.1



1500Vdc PCS& Transformer all-in-one System:

- 2.3/2.4/2.5/2.6/3.45/3.6/3.8/3.95MW
PCS and transformer(Oil-immersed) all-in-one, PCS Output voltage 690V
- Brand: SMA
- Time: After 2024.5.1
- Feature: Off-grid, black start

Battery container and centralized PCS all-in-one machine, form 2.3MW/4.073MWh(2h), 3.95MW/8.146MWh(2h),2.3MW/8.146MWh(4h), or other else energy storage unit. Support black start, off-grid.

Advantages: ultimate safety, High reliability ,good grid , Low initial cost

Application: Front of the meter: Colocated with solar/ wind/hybrids/conventional, Standalone

Excluding behind the meter: Residential, Commercial(preventing sudden power outages
achieving electricity cost reduction through peak valley price arbitrage)

The BESS is mainly in the form of System Solutions



liquid cooling battery cabinet :

- 407.3kWh (306Ah, 0.5C, 0.25C, not 1C)
- Brand: CATL
- Time: After 2024.5.1



1500Vdc PCS& Transformer all-in-one System:

- 1.725/3.45MW PCS(Single module 215KW)and transformer(Oil-immersed) all-in-one, PCS Output voltage 690V
- Brand: Sinexcel
- Time: After 2024.5.1
- Feature: Off-grid, black start(Expected after 2024.7.30)

Battery cabinet and module PCS all-in-one machine , form 1.725MW/3.2584MWh(2h), 3.45MW/6.51MWh(2h), 1.725MW/6.51MWh(4h), or other else energy storage unit. Support black start, off-grid. 6.51MWh includes 16 battery cabinets.

Advantages: ultimate safety, High reliability ,good grid , Low initial cost

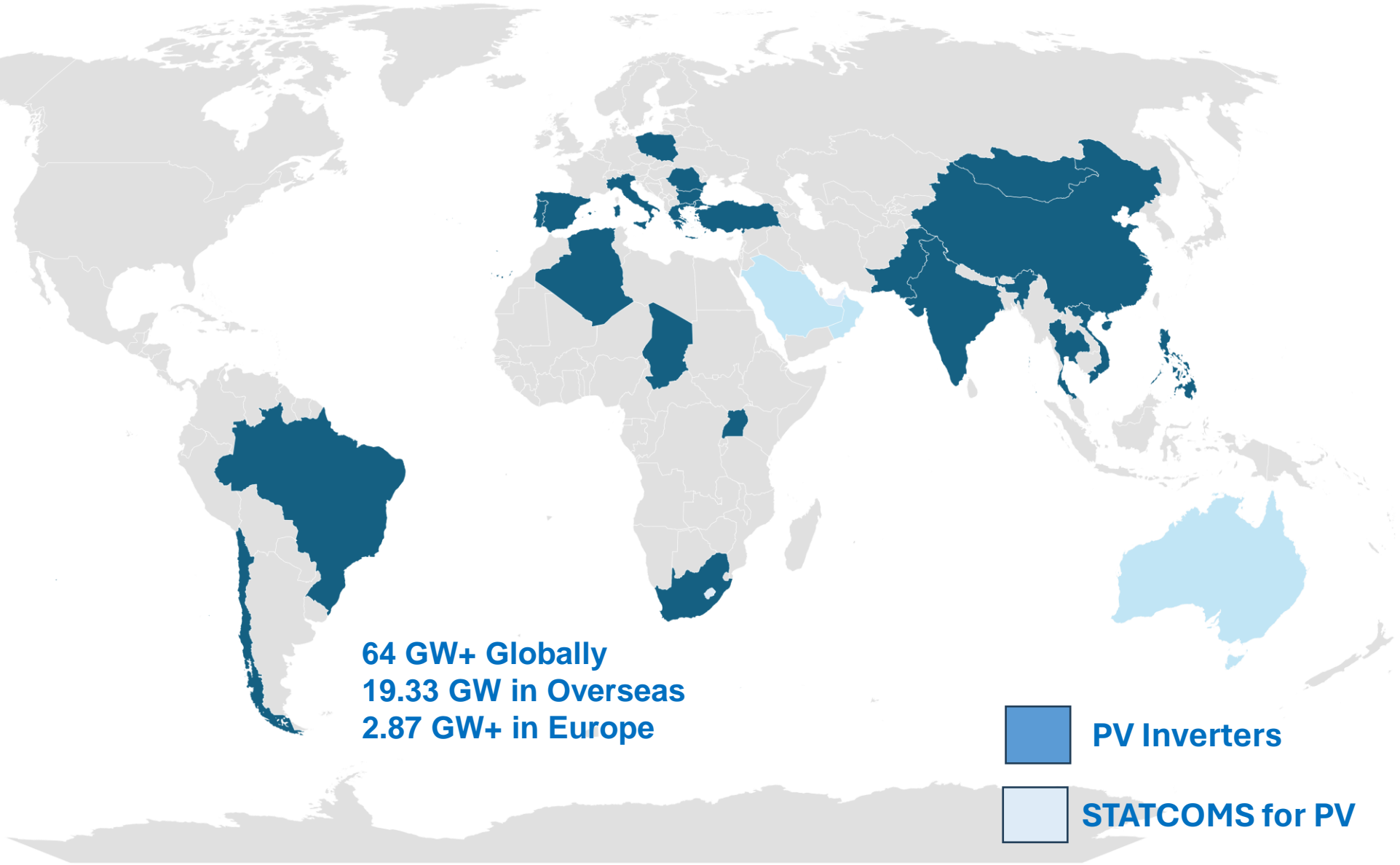
Application: Front of-the-meter: Colocated with solar/ wind/hybrids/conventional, Standalone

Excluding behind-the -meter: Residential, Commercial(preventing sudden power outages

achieving electricity cost reduction through peak valley price arbitrage)



Country	(MW)
China	47800
Brazil	2480
Bulgaria	420
CAR	30
Chad	30
Algeria	160
Poland	70
Greece	153
India	12150
Italy	161
Lesotho	75
Pakistan	350
Philippines	171.8
Portugal	275
Romania	105
South Africa	140
Spain	1663
Thailand	254
Turkey	31.25
Uganda	22.5
Vietnam	185
Chile	264
Australia	40
Saudi Arabia	2700(SVG)
Oman	100





European Structure & Capability

(Totally over 35 professionals dedicated for Europe Market)

- Spain as main operating center and location for European activities
 - Country manager*1 + KAM*3+Technical Manager*2 + Order Fullfiment Manager*3 + O&M Engineer*6+ Contract Manager*1+Administration Manager*1
 - Channel Sales Manager*1
 - Presence in Portugal: Distribution and Integration and Service Partner *1
- Italy & East Europe: Country manager*1 + KAM*1+Channel Sales Director*1+ Technical Manager*2+ Contract Manager*1, New comers: O&M engineer*1+ KAM*1
- Presence in France: Country Manager *1, joining: KAM*1(in July)
- Presence in Poland: Country Manager *1, Channel Sales Manager*1, Distribution and Integration and Service Partner *2
- Presence in Greece :Country Manager*1, Distribution and Service Partner*2+ O&M engineer*1(within July)
- Presence in Bulgaria : O&M Engineer*1+ Distribution and Service Partner*1
- Warehouse in Venlo, Netherlands, Spain-PICKPACK(Madrid), Greece-Energy Experts(Althens), Bulgaria-Allsunday Solutions, Italy(Parma).
- O&M partners to complement our service engineers: Solarig, Revery, Irradia, iQuord, JDC, Sunbank, Edusa, Allsunday Solutions.

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Training to the Customer

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Customer Training at 109MW site in Bulgaria





Site Pictures-2.5MVA Central Solution and 6.85MVA String Solution

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Bulgaria 25MW-Central Inverter+ MV Station Solution



Bulgaria 100MW+67MW+150MW
String Inverter +MV Solution



String Inverter Stations on Spain and Portugal Sites

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Spain:

626MW Central Inverter+MV Station

275.2MW String Inverter+ MV Station

580MW Central Inverter+ MV Station



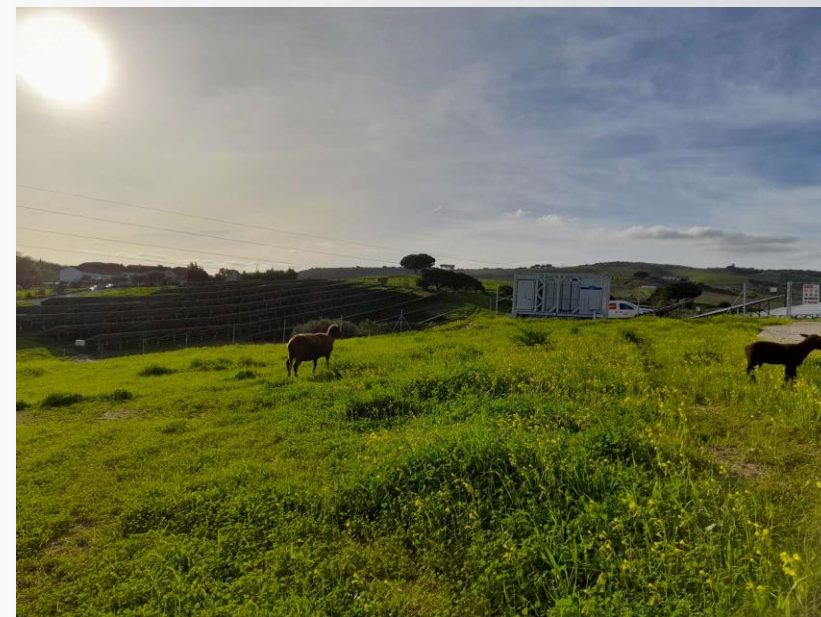
Portugal:

11MW String Inverter

153MW String Inverter

67.75MW String Inverter

230MW String Inverter+MV Station



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1500V Outdoor Solutions



India:
Rajasthan 420MW
Karnataka 250MW
UP 275MW



Vietnam:
Binh An 116MW
Vina 30MW



Chile:
145MW
105MW



Site Pictures-Outdoor Inverter Solutions-2.5MVA/3.75MVA/5MVA

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Site Pictures-Outdoor Inverter Solutions-2.5MVA/3.75MVA/5MVA

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Site Pictures-Containerized Solutions 2.5MVA/3.125MVA

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Refex 110MW



Site Pictures-String Inverter Solutions of 208kW

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GCL YINGSHAN 100MW



POWERCHINA JIANGXI 150MW



Site Pictures-String Inverter Solutions of 208kW

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Bosch 8.7MW



DATANG 12MW

Thank You !