



Energy Infrastructure & Industrial Solutions

Energy Storage Solutions

State-of-the-art Grid Stabilization
and Energy Control



www.deltaww.com





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ABOUT DELTA

Delta was founded in 1971 and has been the global leader in switching power supply solutions since 2002 and DC brushless fans since 2006. Delta offers some of the most energy efficient power products in the industry, including switching power supplies with efficient over 90%, telecom power with up to 98%, and PV inverters with up to 98.8% efficient. We have also developed the world's first server power supply certified as 80 Plus Titanium with over 96% efficient. We regularly invest around 8% of our annual sales revenues in R&D and have worldwide R&D facilities in Taiwan, China, Europe, India, Japan, Singapore, Thailand, and the U.S.

BUSINESS CATEGORIES



- Components
- Power and System
- Fan & Thermal Management
- Automotive Electronics

Innergie



Automation

- Industrial Automation
- Building Automation



Infrastructure

- ICT Infrastructure
- Energy Infrastructure & Industrial Solutions
- Display Solutions

vivitek
TECHNOLOGIES

DELTA JOINS RE100

100% Renewable Electricity and Carbon Neutrality Targets for Its Global Operations by 2030.



2015

Commitments for "We Mean Business"

- Science-based emissions reduction targets (SBT)
- Climate change information in main reports (TCFD)
- Responsible corporate engagement in climate policy

2018

Commitments for EV100

- Scope:**
Delta's major operation sites
- Commitment:**
- Expansion of EV charging facilities
 - Switch to using EVs for company vehicles by 2030
 - Incentives for employees and customers to use EVs

2021

Commitments for RE100

- Use 100% renewable electricity in global operations by 2030

Carbon Neutrality

- Achieve carbon neutrality by 2030

Race to Zero

- Signed business ambition to meet the 1.5°C target

FOCUSED ON SEVEN UN SUSTAINABLE DEVELOPMENT GOALS



4 QUALITY EDUCATION



7 AFFORDABLE AND CLEAN ENERGY



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



17 PARTNERSHIPS FOR THE GOALS

State-of-the-art Grid Stabilization and Energy Control



Energy Storage Solutions

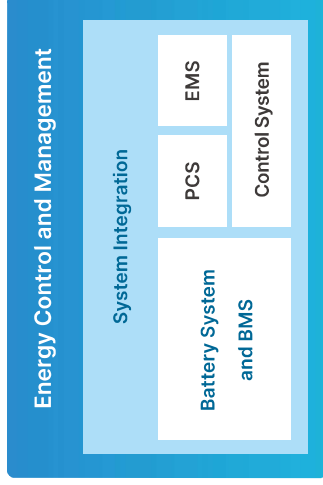
For the green energy transition and energy optimization



In the process of the energy transition, the increasing proportion of renewable energy sources supplying power to the grid means that the amount of generated power will be influenced by the weather, which presents problems for maintaining grid stability.

To improve grid stability and renewable energy utilization, smart grids must be developed and paired with energy storage systems to regulate and dispatch electricity efficiently.

Crucial Technology — Energy Storage Systems



Energy storage systems (ESSs) can control energy to enhance the reliability and energy through four critical technologies: energy management, power conditioning, battery management, and automation.



Control

Energy Control and Dispatch



EMS

Energy Management



PCS

Power Conditioning

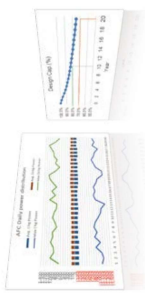


BMS

Battery Management

Energy Storage Solutions

Delta provides energy storage solutions with one-stop manufacturing, integration and maintenance services by offering system design, power conditioning systems (PCS), battery energy storage systems (BESS), control systems, and energy management systems (EMS).



System Design and Simulation

- Service-life forecasting
- Optimal system configuration
- ROI calculations



Battery Energy Storage System

- LFP battery
- Outdoor cabinet and battery system



Energy Management System (EMS)

- Enterprise/system dashboard
- Energy view & reporting
- Multi-site management
- Alarm, event logs



Power Conditioning System (PCS)

- 100 / 125 kW
- 1 - 1.725 MW
- 1.8 - 2.8 MW
- 3.7 - 4.15 MW



Control System

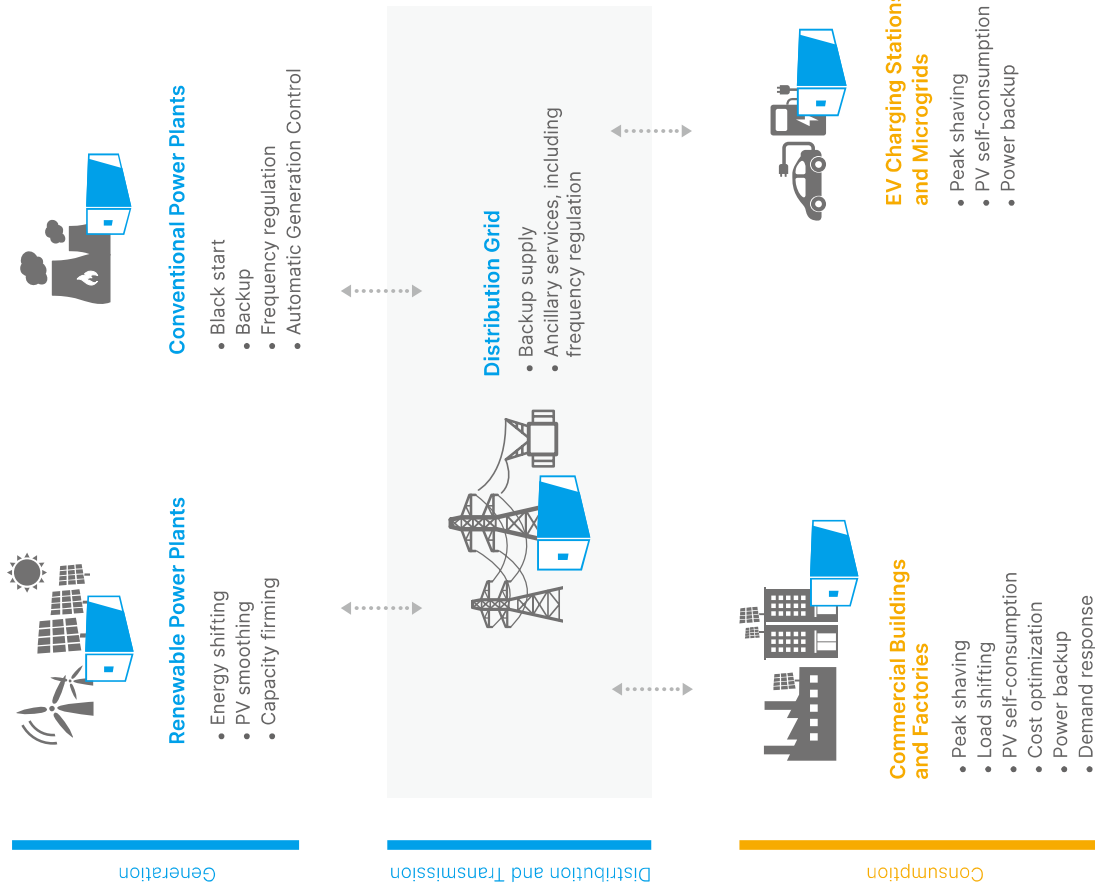
- Data logger
- Bridge controller
- Gateway
- Network switch
- Internal UPS



Engineering, Procurement, Construction (EPC)

- Power distribution unit (PDU)
- MV transformer
- Civil engineering
- Commissioning tests

Energy Storage Applications in Grid Operations

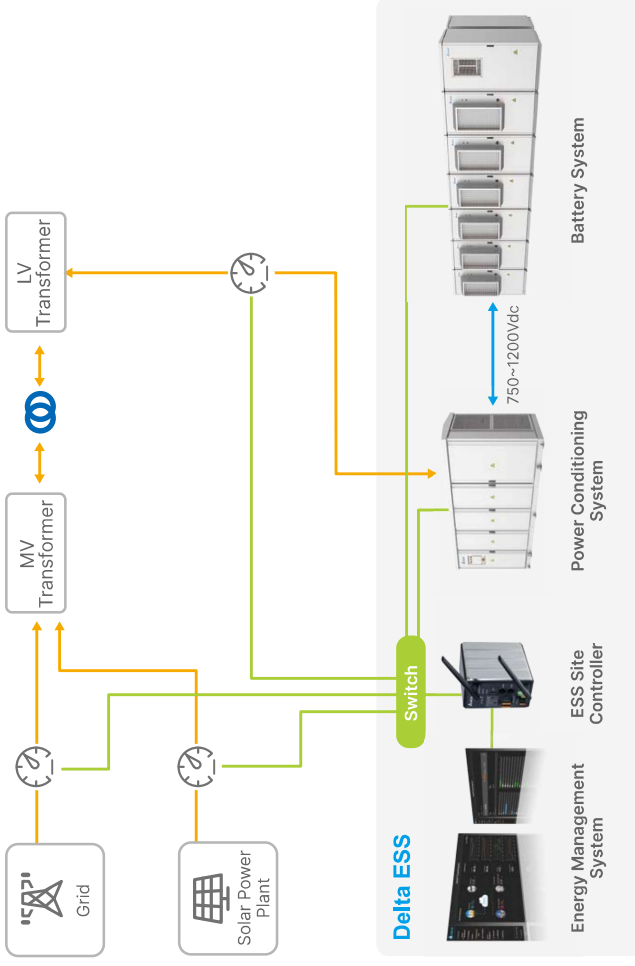


System Architecture

- AC Power
- DC Power
- Communication

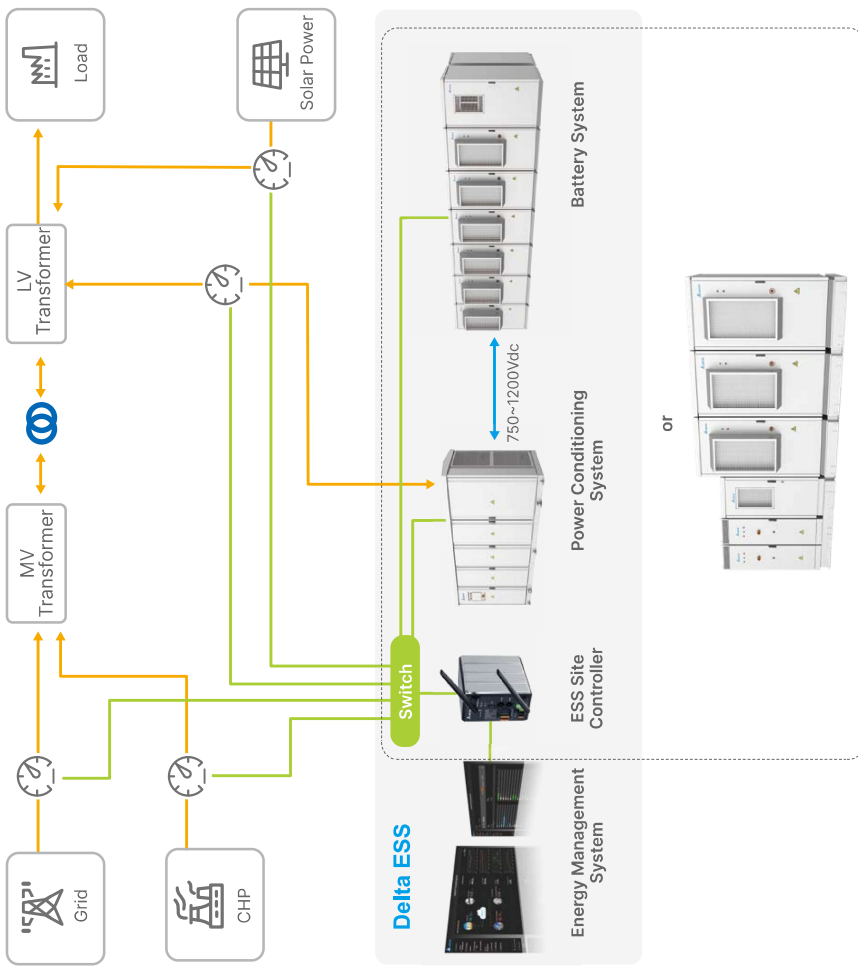
Grid-Tied Applications

Applied to generator backup, grid ancillary services, energy shifting, and renewable energy smoothing.



Behind-the-Meter Applications

Applied to micro-grids, peak shaving, and PV self-consumption, power backup, and more.



Power Conditioning Systems

Power conditioning systems (PCSs) are bidirectional energy storage inverters for grid-tied and off-grid, for C&I and utility-scale applications. Their compactness saves space while offering scalability for various system configurations, as well as integrability with mainstream brand battery systems.

The Core to Control and Regulate Energy



Advanced Power Control

- P/Q control (active/reactive power)
- Frequency/voltage control



Modular Design Ensures High Availability

- Scalable to meet expansion needs
- N-1 redundancy systems



High Environmental Adaptability

- Outdoor protection: dust, water, salt spray, wind, snow and ice, vibration and shock
- Heat dissipation with air/liquid cooling



Dynamic Grid Support

- HVRT/LVRT
- FRT
- Anti-islanding

Selection Guide

UL version



Model	PCS125	PCS125HV
AC Output	125 kW @ 50 °C	125 kW @ 45 °C
Normal Grid Voltage Vrms	480 Vac	480 Vac
Max. Efficiency	97.6 %	> 98 %
Dimensions (W x H x D)	600 x 1765 x 800 mm 23.6" x 69.5" x 31.5"	600 x 2000 x 500 mm 23.6" x 78.7" x 9.7"
Weight Appr.	310 kg 683 lbs	230 kg 508 lbs
Safety	UL 1741	UL 1741
EMC	FCC Part 15 Class A	FCC Part 15 Class A
Grid Code	IEEE1547 / UL1741SA	IEEE1547-2018

IEC version



Model	PCS100	PCS100HV
AC Output	100 kW @ 50 °C	100 kW @ 45 °C
Normal Grid Voltage Vrms	400 Vac	400 Vac
Max. Efficiency	97.9 %	98 %
Dimensions (W x H x D)	600 x 1765 x 800 mm 23.6" x 69.5" x 31.5"	600 x 2000 x 500 mm 23.6" x 78.7" x 9.7"
Weight Appr.	310 kg 683 lbs	230 kg 508 lbs
Safety	IEC/EN 62477-1	IEC 62477-1, EN62477-1
EMC	IEC/EN 61000-6-2, IEC/EN 61000-6-4 (Class A)	IEC/EN 61000-6-2, IEC/EN 61000-6-4
Grid Code	VDE-AR-N 4105/4110, G99, AS/NZS 4777.2	AS/NZS 4777.2:2020



Model	PCS2000	PCS3000
AC Output @ 50 °C	1875 kW	2500 kW
Normal Grid Voltage Vrms	480 Vac	480 Vac
Max. Efficiency	> 97.7 %	> 98.4 %
Dimensions (W x H x D)	4230 x 2290 x 1650 mm 166.5" x 90" x 65"	4450 x 2300 x 1650 mm 175" x 90.5" x 65"
Weight Appr.	5500 kg 12125.4 lbs	5630 kg 12853 lbs
Safety / EMC	UL 1741 / FCC class A	UL 1741 / FCC class A
Grid Code	IEEE 1547 / UL 1741 SA / CSA C22.2 107.1-1	IEEE 1547 / UL 1741 SA / CSA C22.2 107.1-1

Model	PCS1500
AC Output @ 50 °C	1000 kW
Normal Grid Voltage Vrms	400 Vac
Max. Efficiency	98.30 %
Dimensions (W x H x D)	2200 x 2260 x 1100 mm 86.6" x 88.98" x 43.4"
Weight Appr.	2600 kg 5732 lbs
Safety / EMC	IEC 62477, IEC 61000
Grid Code	G99, VDE-AR-N 4110

Power Conditioning System (PCS)



Power capacity
100 / 125 kW
 AC voltage
400 / 480 Vac

Efficiency
97.9 / 97.6 %
 (peak)

Certifications
IEC, UL



PCS100 / PCS125

- Power capacity: 100 / 125 kW; AC voltage: 400 / 480 Vac
- High efficiency: peak 97.9 % / 96.7 %
- High power density: 118 W/l, 323 W/kg / 147 W/l, 403 W/kg
- Quick power response time : < 40 ms
- Connects to major battery types and energy storage media
- Black start capability for power backup and microgrid applications
- Scalable with a multi-unit configuration

Model	PCS100	PCS125
AC Grid Connection		
Rated Grid Voltage	400 Vac, 3P3W	480 Vac, 3P3W
Grid Voltage Range	320 to 440 Vac (VDE-AR-N4105) ¹⁾ 312 to 459 Vac (AS/NZS 4777.2) ²⁾ 320 to 456 Vac (G99) ¹⁾	422.4 to 528 Vac (-12 %, +10 %)
Rated Grid Frequency	50 (60 Hz optional)	60 Hz (50 Hz optional)
Frequency Range	47.5 to 51.5 Hz (VDE-AR-N4105/4110) 47.5 to 52 Hz (G99) 47 to 52 Hz (AS/NZS 4777.2, AS-A, AS-B) 45 to 55 Hz (AS/NZS 4777.2, AS-C, NZS)	59.3 to 60.5 Hz, adjustable
Rated AC Power / Current	100 kVA / 144.3 A	125 kVA / 150.4 A
Max. Continuous AC Current	160.4 Arms	167 Arms
Current THD	< 3 %	< 5 % (IEEE 1547 compliant)
Power Factor	-1 to 1, continuously adjustable	-1 to 1, continuously adjustable
DC Connection		
Voltage Range	600 to 1,000 Vdc	750 to 1,000 Vdc ³⁾
Rated Voltage	900 Vdc	900 Vdc
Rated Discharge / Charge Power	103 kW / 97 kW	129 kW / 122 kW
Max. Discharge / Charge Current	171.7 A / 161.7 A	172 A / 163 A
Standalone Operation		
Rated Output Voltage	400 Vac, 3P3W	480 Vac, 3P3W
Rated Output Power	100 kVA / 100 kW with linear load; 100 kVA with RCD load (CF≧2) ³⁾	125 kVA / 125 kW with linear load; 100 kVA with RCD load (CF≧2) ³⁾
Rated Output Current	144.3 A	150.4 A with linear load; 120 A with RCD load
Power Factor	0.8 to 1	0.8 to 1
Output Voltage THD	< 3 % @ linear load < 5 % @ RCD load (CF≧2)	< 3 % @ linear load < 5 % @ RCD load (CF≧2)
Performance		
Peak / OEC Efficiency	97.9 %	97.6 % / 97.0 %
Standby Loss	< 25 W @ sleep mode	< 25 W @ sleep mode
Environmental		
Max. Altitude	3,000 m, de-rating above 2,000 m	
Operating Temperature	-25 to 60 °C, de-rating @ > 50 °C	
Humidity	0 to 95 % RH, non-condensing	
Acoustic Noise	< 72 dBA @ 1 m @ rated condition	
Cooling	Forced air with speed control	
Enclosure Rating	IP55	Type 3R, IP55
General		
User Interface	4.9" LCD screen	
Emergency Stop	EPO button & remote control	
Communication	Ethernet/Modbus TCP, RS-485/Modbus RTU (optional)	Ethernet/Modbus TCP, RS-485/Modbus RTU (optional)
Dimension (W x H x D)	600 x 1766 x 800 mm / 23.6 x 69.5 x 31.5 inches	
Net Weight	310 kg / 683 lbs	
Certificates	Safety: IEC/EN 62477-1 Grid Code: VDE-AR-N4105/4110, G99, AS/NZS 4777.2 EMC: IEC/EN 61000-6-2, IEC/EN 61000-6-4 (Class A)	UL1741, UL 1741 SA (Rule 21), IEEE1547, FCC part 15 class A, CSA C22.2 No. 1071-01, HECO Listed, CEC Listed
Product Conformity	CE, RCM	
Applicable Battery Chemistry	Lithium-ion, flow battery	Lithium-ion, lead-acid, flow battery

1) @ DC Voltage Range: 700 - 1000 V
 2) @ DC Voltage Range: 750 - 1000 V
 3) Transformer or motor load, which has large inrush current (CF>2), is not included.
 4) DC voltage should be higher than 800 V to support HVRT.

* A dyn transformer is preferable for connecting to a PCS in standalone mode.
 ** If a transformer is required to be added between PCS and load, D type of transformer must be on PCS side.

Power Conditioning System (PCS)



Power capacity

100 / 125 kW

Efficiency

98 % (peak)

AC voltage

400 / 480 Vac

Certifications

IEC, UL



Commercial Building



Hospital



Charging Station



Campus



Factory

PCS100HV / PCS125HV

- Power capacity: 100 / 125 kW; AC voltage: 400 / 480 Vac
- High voltage input: up to 1350 Vdc
- High efficiency: 98 % / above 98 % (peak)
- High power density: 167 W/l, 435 W/kg / 208 W/l, 543 W/kg
- Quick power response time : < 20 ms
- Connects to major battery types and energy storage media
- Scalable with a multi-unit configuration
- Black start capability for power backup
- Supports both grid-tied and power-backup operation modes

Model	PCS100HV	PCS125HV
AC Grid Connection		
Rated Grid Voltage	400 Vac (3P,N,PE) or (3P,PE)	480 Vac (3P,PE)
Grid Voltage Range	352 - 440 Vac	422 to 528 Vac (-12%, +10%)
Rated Grid Frequency	50 Hz	60 Hz
Frequency Range	45 to 55 Hz	59.3 to 60.5 Hz, adjustable
Rated AC Power	100 kVA / kW	125 kVA / kW
Rated AC Current	145 A	151 A
Current THD	< 3 %	< 3 %
DC Current Injection	< 0.5 % rated current	< 0.5 % rated current
Power Factor	-1 to 1, continuously adjustable	-1 to 1, continuously adjustable
DC Connection		
DC Voltage Range	650 to 1,350 Vdc for 3P3W 1) / 700 ~ 1,350 Vdc for 3P4W in Off-grid mode 1), 2)	750 to 1,350 Vdc 1), 2)
Start Up DC Voltage	650 V	750 V
Rated Discharge / Charge Power	102 kW / 98 kW	128 kW / 122 kW
Max. Discharge / Charge Current	157 A / 151 A	157 A / 151 A
Standalone Operation		
Rated Output Voltage	400Vac (3P,N,PE)	480Vac, 3P4W
Rated Output Power	100 kVA / kW with linear load ; 80 kVA with RCD load (Ipk ≤ 240 A) 3)	125 kVA / 125 kW with linear load; 100 kVA with RCD load (Ipk ≤ 240 A) 3)
Power Factor	0.8 to 1	0.8 to 1
Rated Output Current	145 A	151 A
Overload Capacity	110 % for 30 mins	110 % for 30 mins
Output Voltage THD	< 3 % @ rated linear load	< 3 % @ linear load
Performance		
Peak Efficiency	98 %	>98 %
Standby Loss	< 25 W @ cold mode	< 25 W @ cold mode
Environment		
Max. Altitude	4,000 m, de-rating > 2000 m	4,000 m, de-rating > 2000 m
Operating Temperature	-30 °C to +60 °C, de-rating > 45 °C	-30 to 60 °C, de-rating > 45 °C
Humidity	0 to 95 % RH, non-condensing	0 to 95 % RH, non-condensing
Acoustic Noise	< 70 dB @ 1 m @ 25°C @ rated condition, max. 75 dB	< 70 dBA @ 1 m @ rated condition, max. 75 dB
Cooling	Forced air with speed control	Forced air with speed control
Enclosure Rating	IP55	Type 3R / IP55
General		
User Interface	LED, EPO, Ethernet	LED, EPO, Ethernet
Communication	Ethernet / Modbus TCP	Ethernet / Modbus TCP
Dimension (W x H x D)	600 x 2000 x 500 mm	600 x 2000 x 500 mm
Net Weight	230 kg	230 kg
Certificates (in plan)	Safety: IEC 62477-1, EN62477-1 Grid Code: AS/NZS 4777.2:2020, VDE-AR-N 4105, VDE-AR-N 4110, G99 and EN 50549-1 EMC: IEC/EN 61000-6-2, IEC/EN 61000-6-4 Vibration: IEC 60068-2-6:2007	UL1741, UL1741 SB, IEEE 1547 : 2018, FCC part 15 class A
Protection	DC reverse protection / OVP / LVP / OCP / DC insulation detection	DC reverse protection / OVP / UVP / OCP / DC insulation detection
Product Conformity	CE, RCM	CE, RCM
Applicable Battery Chemistry	Lithium-ion, lead-acid, flow battery	Lithium-ion, lead-acid, flow battery

1) Output power will be de-rating, if DC voltage is higher than 1250V
2) The minimum DC voltage should be larger than 750V, if the load is 100% unbalanced load
3) Transformer or motor load or rectifier load, which has large inrush current (Ipk>240A) is not included

Power Conditioning System (PCS)



Power capacity
1000 - 1725 kW (peak)
 Efficiency
98.4 %

AC voltage
400 - 690 Vac
 Certificate
IEC



PCS1500

- Power capacity: 1000 to 1725 kVA
- High DC voltage: up to 1500 Vdc
- 98.4 % efficiency for bi-directional power conversion
- Advanced P/Q, frequency/voltage and VSG control
- Modular design enables scalability and easy maintenance
- Utility-grade protection designed for outdoor use in harsh environments
- Compatible with major battery types and energy storage media
- DC and AC-coupled storage applications

Model	EPCS1000-IEC	EPCS1200-IEC	EPCS1500-IEC	EPCS1725-IEC
DC Connection				
Full Power DC Voltage Range ⁽¹⁾	623 to 1500 V	762 to 1500 V	952 to 1500 V	1052 to 1500 V
Max DC Charge Continuous Current	1617 A			
Max DC Discharge Continuous Current	1666 A			
AC Connection				
AC Output Power (@50°C)	1000 kW / kVA	1200 kW / kVA	1500 kW / kVA	1725 kW / kVA
Max AC Output Continuous Current	1672 A			1448 A
Normal Grid Voltage Vrms ⁽²⁾	400 V	480 V	600 V	690 V
Normal Grid Frequency	50 / 60 Hz			
Current Harmonic Distortion (THD) ⁽³⁾	< 3 % IEEE519			
Power Factor	Four quadrants			
Efficiency				
Max. Efficiency	98.30 %	98.35 %	98.50 %	98.52 %
CEC Efficiency	98.00 %	98.14 %	98.37 %	98.38 %
Protection				
DC Side	DC Load switch + DC Fuse			
AC Side	AC circuit breaker			
DC Overvoltage	Surge arrester, class II as standard			
AC Overvoltage	Surge arrester, class II as standard			
Ingress Protection	IP55 / IP34 / IP34 electronics / air duct / connection area			
General				
Dimensions (W x H x D)	2200 x 2260 x 1100 mm			
Weight Appr.	2600 kg			
Environment				
Operating Temperature ⁽³⁾	-30 °C to + 60 °C, de-rating above 50 °C			
Storage Temperature	-30 °C to +70 °C			
Relative Humidity	0 % to 95 % RH, non-condensing			
Altitude ⁽⁴⁾	< 4000 m, de-rating above 2000m			
Acoustic Noise (1m)	< 79 dB(A) @ 25 °C, full power			
Cooling	Forced air cooling			
Compliance				
Safety / EMC	IEC 62477 / IEC 61000-6-2, IEC 61000-6-4			
Grid Code	VDE AR-N 4110 / G99			

(1) Minimum DC voltage for normal grid AC voltage and power factor=1. The minimum DC voltage depends on AC voltage and power factor
 (2) The PCS only allows access to the distribution grid (e.g. 400V, 480V) through upstream isolated transformer
 (3) THDI at nominal power

Power Conditioning System (PCS)



Power capacity

2100 - 2800 kW

Efficiency

97.7 % (peak)

AC voltage

480 Vac

Certificate

UL



Utility Grid



PV Plant



Factory

PCS2000

- Power capacity: 2100 to 2800 kVA
- 97.7 % efficiency for bi-directional power conversion
- Advanced P/Q and frequency/voltage control
- Modular design enables scalability and availability
- Compatible with major battery types and energy storage media
- Utility-grade protection designed for harsh environments
- AC coupled storage applications



Model	DWE2100-US	DWE2800-US
DC Connection		
Input Voltage Vdc, full load	760 to 1200 V	
Input Voltage Vdc, max	1200 V	
Max. Input Current IDC, max (@ 50 °C)	2528 A	3370 A
Number of DC Inputs	1	
AC Connection		
AC Power / Current (@ 25 °C / 50 °C)	2100 kVA / 1875 kVA	2800 kVA / 2500 kVA
Max. AC Current Iac, max (@ 50 °C)	2526 A	3368 A
Max. Total Harmonic Distortion ⁽¹⁾	< 3 % at full load	
Nominal AC Voltage	480 V	
AC Power Frequency	60 Hz	
Power Factor	0 to 1 leading or lagging	
Performance		
Max. Efficiency ⁽²⁾	> 97.7 %	
CEC Efficiency	97 %	
Standby Loss ⁽³⁾	< 350 W	
Protection		
DC Side	DC load switch + fuses	
AC Side	AC circuit breaker	
DC Overvoltage	Surge arrester, class II	
AC Overvoltage	Surge arrester, class II	
Ingress Protection	IP 65, Type 3R	
General		
Dimensions (W x H x D)	4230 x 2290 x 1650 mm / 166.5 x 90 x 65 inches	
Weight	5500 kg / 12125.4 lbs	6500 kg / 14330 lbs
Power Module	3	4
Environment		
Operating Temperature	-30 °C to + 60 °C, de-rating > 50 °C	
Storage Temperature	-40 °C to + 70 °C	
Relative Humidity	5 to 100 % RH	
Altitude	< 3000 m, de-rating > 2000 m	
Acoustic Noise ⁽⁴⁾	< 85 dB (A)	
Cooling	Liquid cooling (integration)	
Compliance		
Safety	UL 1741	
EMC	FCC class A	
Grid Interconnection	IEEE 1547 / UL 1741 SA / CSA C22.2 107.1-1	

1) THD measured under grid short current ratio ≤ 5.
 2) Efficiency measured without internal auxiliary power loss.
 3) Standby loss measured under external power supply.
 4) Noise measured at a distance of 3 m.

Power Conditioning System (PCS)



Power capacity
3110 - 4150 kW (peak)
 Efficiency
98.4 %
 AC voltage
600 Vac
 Certificate
UL



PCS3000

- Power capacity: 3110 to 4150 kVA
- 98.4 % efficiency for bi-directional power conversion
- Advanced P/Q and frequency/voltage control
- Modular enables realizes scalability and availability
- Compatible with major battery types and energy storage media
- Utility-grade protection designed for harsh environments
- AC coupled storage applications

Model	DWE3110-EV-US	DWE4150-EV-US
DC Connection		
Input Voltage VDC Range ⁽¹⁾	875 - 1500 V	
Input Voltage VDC, max	1500 V	
Max. Input Current IDC, max (@ 50°C)	3269 A	4359 A
Number of DC Inputs	1/2 (optional)	
AC Connection		
AC Power (25°C / 50°C) @ PF=1, 600Vac	3117 kVA / 2805 kVA	4156 kVA / 3741 kVA
Max. AC Current IAC, max (25°C / 50°C)	3000 A / 2700 A	4000 A / 3600 A
Max. Total Harmonic Distortion ⁽²⁾	< 3% at full load	
Nominal AC Voltage	600 V	
AC Power Frequency	60 Hz	
Power Factor (depending on voltage)	0 to 1 leading or lagging	
Performance		
Max. Efficiency ⁽³⁾	98.4 %	
CEC Efficiency	98 %	
Standby Loss ⁽⁴⁾	< 350 W	
Protection		
DC Side	DC switch + fuses	
AC Side	AC circuit breaker	
DC Overvoltage	Surge arrester, class II	
AC Overvoltage	Surge arrester, class II	
Ingress Protection	Type 4X	
General		
Dimensions (W x H x D)	4450 x 2300 x 1650 mm / 175 x 90.5 x 65 inches	
Weight	5830 kg / 12853 lbs	6330 kg / 13955 lbs
Power Module	3	4
Environment		
Operating Temperature	-30 °C to +60 °C, de-rating > 50 °C	
Storage Temperature	-40 °C to +70 °C	
Relative Humidity	5 to 100 % RH	
Altitude	< 3000 m, de-rating > 2000 m	
Acoustic Noise ⁽⁵⁾	< 85 dB (A)	
Cooling	Liquid cooling (integration)	
Compliance		
Safety	UL 1741	
EMC	FCC class A	
Grid Interconnection	IEEE 1547	

1) Consult Delta for de-rating curves.
 2) InDC measured under grid short current ratio ≥ 5 .
 3) Efficiency measured without internal auxiliary power loss.
 4) Standby loss measured under external power supply.
 5) Noise measured at a distance of 3 m.

Battery Energy Storage Systems

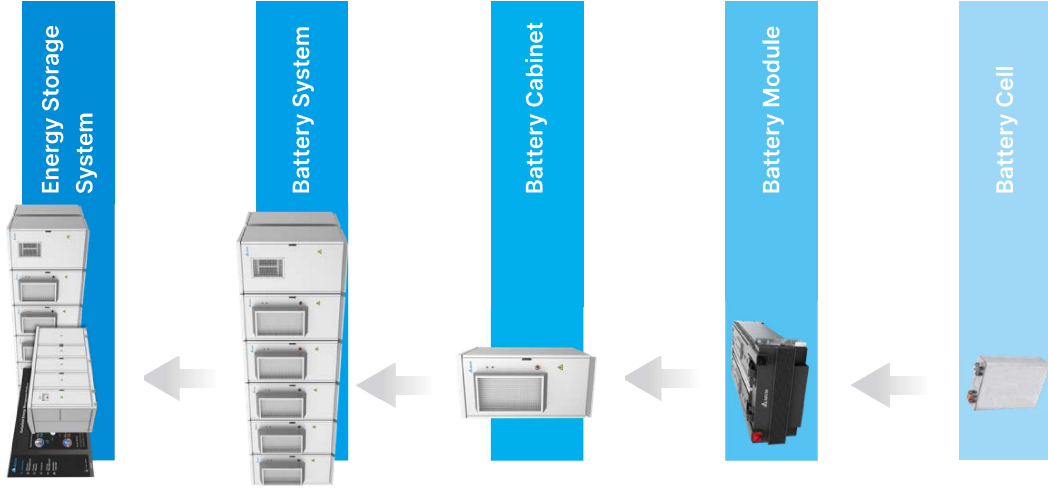
Delta's BESS offer a complete system design with features such as high energy density, battery management, multi-level safety protection, and outdoor cabinets with a modular design. Furthermore, it meets international standards used worldwide.

Ensure Safe, Highly-Adaptable, and Scalable Systems

LFP Battery

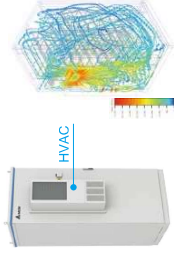


Multi-Level Safety



- Integrates PCS, grid controller communication, and system protection mechanisms
- Diagnostics, monitoring and control with EMS
- High-safety power circuit design
- Multiple environmental monitoring systems
- Multi-level BMS
- HW: DC contactor, fast-melting fuse
- SW: Cell monitoring, alarm, and protection
- Safety: Anti-fire propagation, HVAC temperature control, auto fire suppression
- Thermal management, anti-propagation
- Integrated PCB to enhance reliability
- Multi-point temperature detection and protection design
- International safety certifications
- IEC 62619, UL1973, UN 38.3

Battery Cabinet Safety Design



Thermal Management

- Thermal management in cabinet
- HVAC in each cabinet to optimize cooling efficiency
- Airflow guide to improve temperature consistency

Fire Proofing

- Fire-resistant fiber covers the inner walls to prevent fire propagation
- Alarm mechanisms: smoke and thermal detectors
- Automatic fire suspension system



Protection Design

- Flood detector
- Aseismic structure for GR63 Zone-4

Battery Verification Laboratory

Delta's own battery verification lab was accredited by UL and DEKRA, and is qualified to verify the following standards to ensure the performance and reliability of our battery products.



UL : WTDP: UL1973

CTF Stage 2: IEC 62619 and JIS C 8715-2 (S-mark)

DEKRA: IEC 62368-1:2014 and IEC 62619:2017



Battery Energy Storage System



Battery Chemistry
LFP
 Max. Installed Capacity
315 kWh

Max. DC voltage
1267 Vdc



LFP Battery Cabinet

- DC voltage: up to 1267 Vdc
- Max. installed capacity: up to 315 kWh per cabinet
- Scalable and flexible configuration
- IP55 stainless enclosure with corrosion-resistant painting
- Built-in battery management system, HVAC, and automatic fire suppression system
- Certification: UL9540A, UL1973, IEC 62619, IEC 62477-1, UL9540, UN38.3



LFP

Model Series	EBSO-TE2815S1PX00	EBSO-CE2816S1PP00 (Primary) EBSO-CE2816S1PS00 (Secondary)
Model	EBSO-TE2815S1PP00 (Primary) EBSO-TE2815S1PS00 (Secondary)	EBSO-CE2816S1PP00 (Primary) EBSO-CE2816S1PS00 (Secondary)
Battery Solution	LFP 280Ah Cell	LFP 280Ah Cell
Cabinet Configuration	330S-1P	352S-1P
Cabinet Modules	15 Modules	16 Modules
Battery System Install Capacity	295.7 kWh	315 kWh
Recommend DC Operating Capacity	258.0 kWh	275 kWh
Recommend AC Operating Capacity	245.8 kWh	264 kWh
Environment Condition	Outdoor	Outdoor
Ingress Protection	IP55 , Type 3R, NEMA 3R compliance	IP55 , Type 3R, NEMA 3R compliance
Gross Weight	3500 kg / 7717 lbs	3700 kg / 8047 lbs
Dimension (W x D x H)	Include HVAC: 1200 x 1662 x 2440 mm 47.3 x 65.35 x 96.1 inches	Include HVAC: 1200 x 1662 x 2440 mm 47.3 x 65.35 x 96.1 inches

Battery Energy Storage System

Battery Chemistry **LFP** Max. DC voltage **1267 Vdc**

Max. Installed Capacity **4.4 MWh**



LFP Battery System

- DC voltage: up to 1267 Vdc
- Max. installed capacity: up to 4.4 MWh per battery system
- Scalable and flexible configuration
- IP55 stainless enclosure with corrosion-resistant painting
- Built-in battery management system, HVAC, and automatic fire suppression system
- Certification: UL9540A, UL1973, IEC 62619, IEC 62477-1, UL9540, UN38.3

Available Market: Global



LFP

Model Series	EBSB-TE2815SXXPP02	EBSB-TE2815S10PP02	EBSB-TE2815S12PP02	EBSB-TE2815S14PP02
Model	LFP 280 Ah Cell	352S-1P	15 Modules	295 kWh
Battery Solution	10	12	14	
Battery System Installed Capacity	2956 kWh	3548 kWh	4139 kWh	
Recommended DC Operating Capacity	2580 kWh	3096 kWh	3612 kWh	
Recommended AC Operating Capacity	2457 kWh	2949 kWh	3440 kWh	
DC Voltage Range	907 to 1188 Vdc			
Ingress Protection	IP55, Type 3R, NEMA 3R compliance			
Gross Weight	37,500 kg	44,500 kg	51,500 kg	
Dimension (W x D x H)	7300 x 3740 x 2440 mm (Include HVAC)	8520 x 3740 x 2440 mm (Include HVAC)	9740 x 3740 x 2440 mm (Include HVAC)	

Model Series	EBSB-CE2816SXXPP02	EBSB-CE2816S10PP02	EBSB-CE2816S12PP02	EBSB-CE2816S14PP02
Model	LFP 280 Ah Cell	330S-1P	16 Modules	315.3 kWh
Battery Solution	10	12	14	
Battery System Installed Capacity	3153 kWh	3783 kWh	4414 kWh	
Recommended DC Operating Capacity	2752 kWh	3302 kWh	3852 kWh	
Recommended AC Operating Capacity	2643 kWh	3171 kWh	3700 kWh	
DC Voltage Range	968 to 1232 Vdc			
Ingress Protection	IP55, Type 3R, NEMA 3R compliance			
Gross Weight	39,500 kg	46,900 kg	54,300 kg	
Dimension (W x D x H)	7300 x 3625 x 2440 mm (Include HVAC)	8520 x 3625 x 2440 mm (Include HVAC)	9740 x 3625 x 2440 mm (Include HVAC)	

DeltaGrid® EM for Energy Storage System

The DeltaGrid® EM energy management system is a forwardlooking digital platform that leverages novel AIoT technologies for energy control, cybersecurity and reliability energy consumption optimization, utility ancillary services, distributed energy resource (DER) generation monitoring, reduction of carbon emissions tracking, and other applications.

Its control modes and AI algorithm can control energy flows precisely and automatically, thus optimising energy usage, maximizing system performance and making your energy systems greener and more economical. DeltaGrid® EM can be paired with the DeltaGrid® O&M digital services platform to upkeep energy assets, maximize uptime and increase operational efficiency.



System Design and Features

Advanced digital platform with up-to-date AIoT, security, and reliability technology to protect your energy system and maximize system uptime, thus optimizing your operational efficiency.

Cyber Security

Reduce maintenance and transaction risks

- IEC 62443-4-1
- IEC 62443-3-3
- VLAN/VPN/TLS

High Availability Redundancy

24/7 operation with self-detection and quick recovery

- Virtual Router Redundancy Protocol (VRRP)
- DeltaGrid IoT Hub

Container-based Architecture

Rapid extension, deployment, and integration

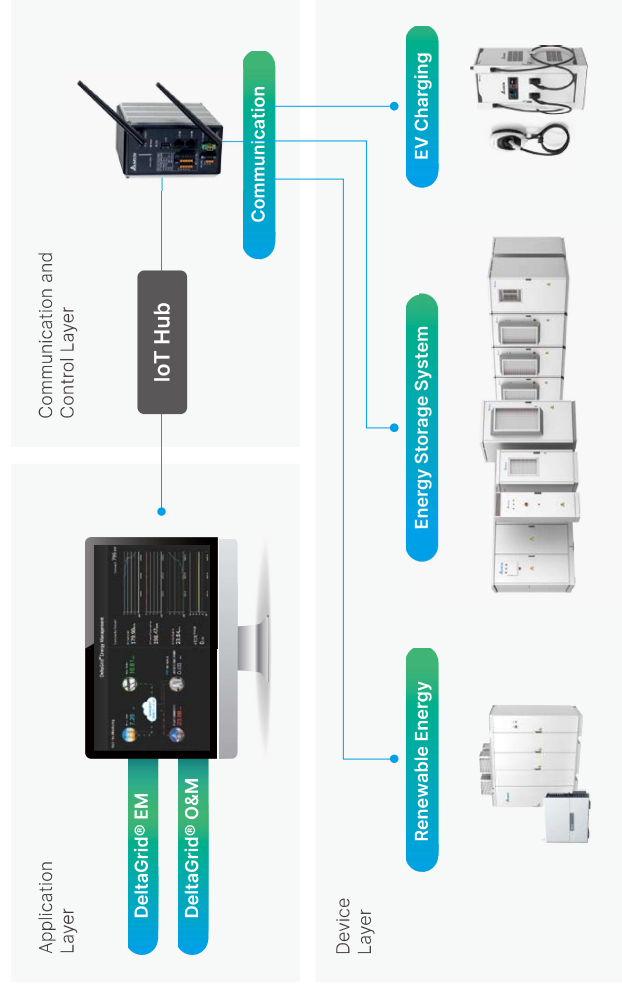
- Single UI with support for optional application modules
- IoT Hub & Virtual Gateway
- Micro service framework

Network System Diagnostics

Nonstop operation and services

- Network communication status
- System operational status
- Monitoring of platform service status

System Architecture



Application Highlights



Optimized Energy Dispatching for Nanogrids

Energy Control

- Peak shaving, including flattening of EV charging peaks
- Load shifting
- Self-consumption optimization
- Power backup

Nanogrid Energy Management

- Real-time energy monitoring and control
- Integrated operation with renewable energy
- Special features to support EV charging infrastructure



Frequency Regulation and Utility Ancillary Services

Energy Control

- FP, PQ, VP, VQ, VPQ, PF modes
- Backup power

Management of Grid Ancillary Service Operation

- Energy Trading



Renewable Energy Smoothing

Energy Control

- PV or wind smoothing
- Energy shifting
- Capacity firming

Multi-Site Management

- Real-time power generation
- Accumulative power generation
- Reporting

Single-Site Performance Management

- Day-by-day generation / sunlight monitoring
- Month-to-month comparison
- Predicted and actual power generation comparison



Digital Operation & Maintenance Services

Real-Time Device Management

- Remote access and OTA software updates
- Data collection

Predictive Maintenance

- Prescriptive maintenance
- Preventive maintenance

Remote Support with AR Capabilities

- Fast response with remote collaboration via mobile
- Logging of critical data for precise diagnostics

Work Order Management

- Repair status tracking
- Optimization scheduling
- Smart route planning

Inventory-Based Service Dispatching

- Customer information synchronization
- Spare parts tracking and procurement

Function List

Model	Multi-site Management	Metering	Dashboard	Scheduling	Time of Use	Frequency Regulation	Peak Shaving	PV Output Smoothing	Energy Shifting	Target SoC	Consumption Analysis	Abnormal Usage Analysis	Reporting	Energy Trading & Data Delivery	Asset Management	Error Notification & Work Order	Single Line Diagram	Utility Ancillary Services	Nanogrid Energy Optimization	Distributed Energy Resources + ESS Control	Factory Carbon Emission Tracking	
Basic																						
Energy Control Mode																						
Management & Analysis																						
Operation & Maintenance																						

Worldwide Success Cases

Utility and Grid Ancillary Services



Delta Pingjhen Plant
5 MW / 3.6 MWh



Taipower Kimmen XiaXing Power Plant
2 MW / 1 MWh



AIDC Taichung Factory
1 MW / 1 MWh

Solar Power Plants



Kaohsiung Yong-an Solar Power Plant
1 MW / 1 MWh



Changhua Coastal Park Solar Power Plant
1.5 MW / 1.5 MWh

Commercial & Industrial Application



Cyntec Factory
500 kW / 3 MWh



National Changhua University of Education
1 MW / 1 MWh

Micro-Grid



CPC Corporation Chaiji Gas Station
500 kW / 3 MWh



Taipower Fengshan Green Community
500 kW / 1 MWh



Japan Sahamihara Micro-grid
500 kW / 880 kWh

Taiwan Success Case Highlights

- Utility and Grid Ancillary Services
- Solar Power Plants
- Commercial & Industrial Application
- Micro-Grid



Success Story

Utility and Grid Support

Delta Taiwan Pingjhen Plant

- Grid Ancillary - regulation reserve • 5 MW / 3.6 MWh

Delta's 5 MW / 3.6 MWh ESS in the Delta Pingjhen Plant joined the Taipower Energy Trading Platform on November 1, 2021, providing auxiliary services to help regulate the grid frequency and stabilize the power grid.



Success Story

Utility and Grid Support



Taipower's Kinmen Xiaxing Power Plant

- Generator backup, frequency regulation, renewable energy smoothing • 2 MW / 1 MWh

Delta's ESS at Taipower's Kinmen Xiaxing Power Plant is a power dispatching tool for Kinmen's grid, designed to improve power supply stability. In daily operations, the system regulates the frequency of the power grid and renewable energy. When a generator trips, it can provide backup power to hold the grid within just 0.2 seconds.

Taipower's Lanyu Power Plant

- Peak shaving, frequency regulation, spinning reserve • 500 kW / 1.1 MWh



This ESS can regulate the power frequency to stabilize the independent power grid of Lanyu Island. During tourism booms, it can perform peak shaving to solve the problem of power supply bottlenecks. When the generator trips, it can also provide power to support the grid in just 0.2 seconds.

Success Story

Solar Power Plant

Taipower's Kaohsiung Yongan Solar Power Plant

- PV smoothing • 1 MW / 1 MWh

The Kaohsiung Yongan PV Power Plant was built in 2011. It covers a total area of 9.45 hectares, has a PV capacity of 5 MW, and an overall annual power generation of about 6 million kWh. To improve PV power generation efficiency, Delta helped the Kaohsiung Yongan solar power plant build a 1MW/1.1MWh ESS. This ESS has improved PV power generation performance with PV smoothing and frequency regulation while reducing grid stress due to large fluctuations in renewable energy.



Success Story

Solar Power Plant



Changhua Coastal Park Solar Power Plant

- PV smoothing, demand response • 1.5 MW / 1.5 MWh

The 1.5 MW / 1.5 MWh ESS built by Delta in the Taiwan Changbin Solar Power Plant was accepted in December 2020. This was Delta's fourth megawatt-level ESS in Taiwan. It adopts a brand-new outdoor battery cabinet and PCS to regulate the solar power produced by the Changbin Solar Power Plant and eliminate intermittencies in renewable energy.



Japan Delta Ako Energy Park

- PV smoothing • 500 kW / 362 kWh

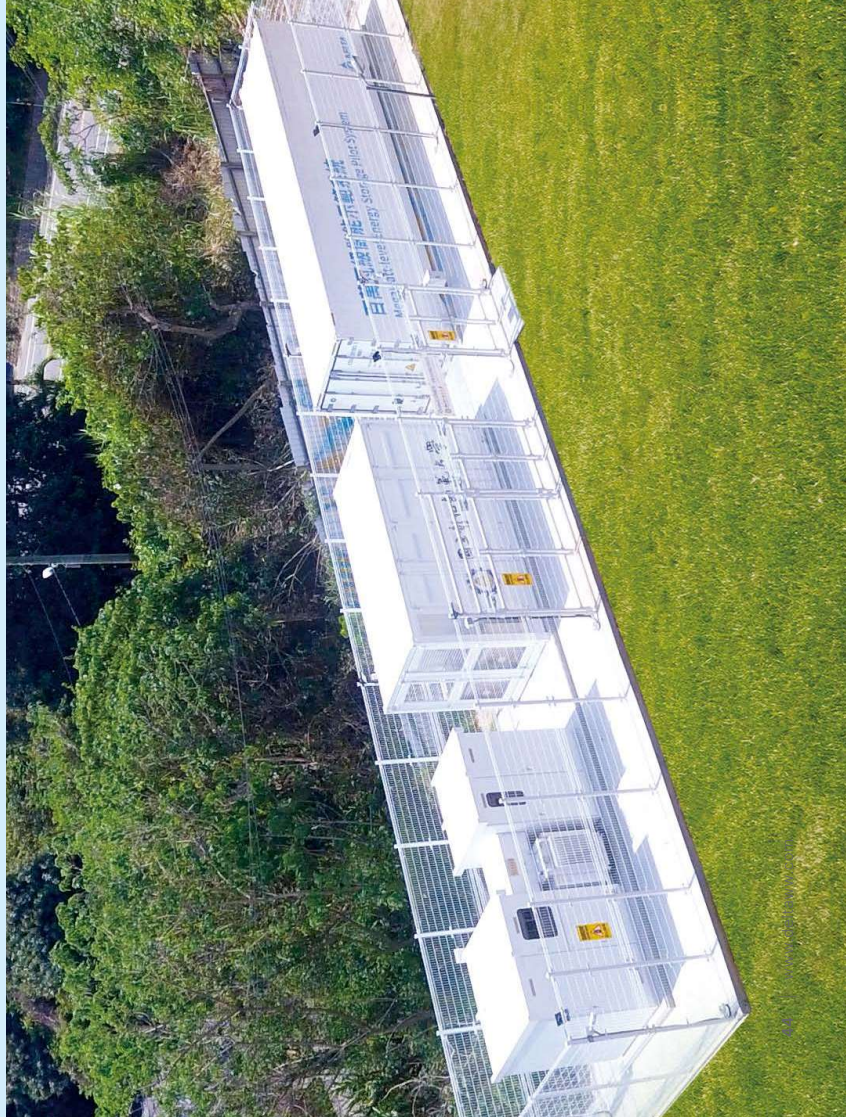
Success Story

Commercial & Industrial Application

National Changhua University of Education

- Peak shaving, offgrid operation, power backup • 1 MW / 1 MWh

The 1 MW / 1 MWh ESS created by Delta's one-stop service (including investment benefit evaluation, customized solution planning, construction, orientation, and training) allows National Changhua University of Education to not only stabilize the grid and regulate electricity, but also to optimize contract capacity to reduce waste and minimize penalty charges while deepening academic research on micro-grids and intelligent energy.



Success Story

Commercial & Industrial Application



Cyntec Factory

- Backup power, demand response • 500 kW / 3 MWh

Delta provided a 500 kW / 3 MWh ESS for its subsidiary Cyntec's plant in Hsinchu Science Park. The system not only provides backup power for the plant, but it also supplies power to the plant through participating in Taipower's demand response program and avoids affecting Taipower's energy production.



Gravel in California, USA

- 500 kW / 880 kWh

Success Story

Micro-Grid

CPC Corporation Chaiyi Gas Station

• Support E-Scooter charging, PV smoothing, load shifting • 250 kW / 500 kWh

Delta assisted CPC Corporation, a Taiwan leading energy resource provider, to build their first green energy demonstration station by retrofitting a Chaiyi gas station into an e-scooter charging station by utilizing renewable energy generated by a rooftop solar system regulated by an ESS.



Success Story

Micro-Grid



Japan MHIET's Triple Hybrid Power Micro-Grid

• 500 kW / 250 kWh

Delta helped Mitsubishi Heavy Industries build a triple hybrid stand-alone power system, EBLIX, demonstrated in Sagamihara. The system adopts Delta's ESS and solar inverters, and combines them with a gas engine generator. It is environmentally friendly and meets the increasing demand for safe energy in the event of a disaster.



Taipower Fengshan Green Community

• 500 kW / 1 MWh

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All information and specifications are subjected to change without prior notice.

