COMUNE DI CIMINNA
PROVINCIA DI PALERMO
REGIONE SICILIA

IMPIANTO DI PRODUZIONE ENERGIA ELETTRICA DA FONTE RINNOVABILE FOTOVOLTAICA DENOM. "CIMINNA AGROVOLTAICO"
POT. IMP. FV 33.887,80 kWp - POT. IMM. IMP. FV 32.800,00 kWac
POT. IMP. SIST. ACCUMULO 15.750,00 kW - POT. IMM. 15.000,00 kWac

Proponente

Solar Energy Venti Srl

Via Sebastian Altmann 9, - 39100 - Bolzano (BZ)

Progettazione impianto FV

Preparato
Rossella Ing. Sannasardo

Approvato
Antonio Ing. Nastri

Verificato
Francesco geom. Bruno

ORDINE DEGLI INGEGNERI DELLA PROVINCIA DI PALERMO
Ing. Antonio Nastri n° 7637

Progettazione SIA

Gestore rete elettrica

CP: 202000577

Visto approvazione

_____

PROGETTO DEFINITIVO

Titolo elaborato

PROGETTO IMPIANTO FOTOVOLTAICO
SCHEDE TECNICHE COMPONENTI IMPIANTO FV

Elaborato N.	*Data emissione* 20/12/2021			
RS06EPD0014A0	*Nome file* CIMINNA AGRICOLO			
N. Progetto	*Scala* -	00	20/12/2021	PRIMA EMISSIONE
		REV.	DATA	DESCRIZIONE

SCHEDA TECNICA TRACKER

STI-H250™
Seguidor bifila a un eje
Datos técnicos

Adaptación al terreno | Carga de viento | Carga de nieve | Carga de sismo | Sin engrase | Túnel de viento | Test dinámico | 10 años Garantía | Patentado

Diseño

- Accionamiento rotativo electromecánico irreversible con motor reductor de alta eficiencia de únicamente 88W de potencia.
- Autoalimentado con módulo o alimentado desde la red.
- Amplio recorrido de giro: 110° (± 55°).
- Tolerancia a las pendientes elevadas.
- Gran adaptación a terrenos irregulares.
- Disponibilidad superior al 99,9%.
- Compatible con diferentes soluciones de cimentación: hinca metálica, pre-taladros, micropilotes, zapatas.
- Compatible con todo tipo de paneles (con marco, glass-glass, thin-film, bifacial).

Sistema de control

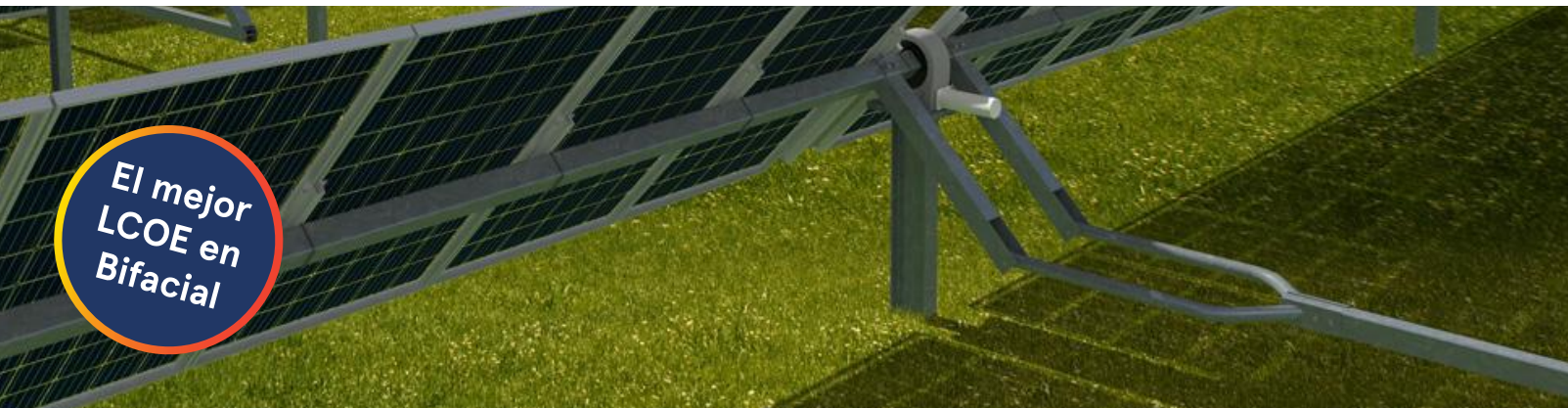
- Alta fiabilidad de operación.
- Gestión de alarma completamente configurable por el cliente.
- Algoritmo de backtracking personalizado a cada seguidor solar STI-H250™, evitando sombras y aumentando la producción.
- Fácil integración en el sistema de comunicaciones y SCADA de la planta gracias al Modbus TCP / IP standard.
- Sistema de comunicación Wireless Zigbee®.
- Monitorización remota y mantenimiento predictivo (evita paradas y aumenta la disponibilidad).
- Rápida puesta en marcha y herramientas de backtracking.

Operación y Mantenimiento

- Acceso libre para limpieza de paneles.
- Mínima inversión en labores de O&M gracias al reducido número de componentes, la sencillez y robustez del sistema.
- Mantenimiento mínimo.
- Elementos de rotación libres de lubricación.

Montaje

- Mínimo tiempo de instalación, rápido y simple.
- Altas tolerancias al error de posicionamiento de cimentación, tanto en los tres ejes (X, Y, Z) como al giro en los ejes Y y Z.
- Altura baja del panel para un fácil montaje.
- Conexiones 100% atornilladas. Sin perforación, corte o soldadura en el sitio.



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Av. Sancho el Fuerte, 26 bis, of. 1
31008 Pamplona, Navarra (España)

info@stinorland.com
stinorland.com

STinorland

Especificaciones técnicas

IEC 62817 | SELF POWERED | TÜVRheinland CERTIFICADO | Sistema de Gestión ISO 9001:2008 ISO 14001:2004 | www.tuv.com ID 9105067985

CARACTERÍSTICAS GENERALES

Tipo de seguidor	Seguidor descentralizado bifila de un eje horizontal
Ratio de cobertura en el suelo (GCR)	Estándar 33%*
Área de módulos por seguidor	Aprox. 250 m^2

DIMENSIONES (con módulos de 72 cél. y 1/GCR = 3)*

Módulos por viga de torsión	60*
Número de filas	2
Potencia pico instalada (módulo de 400Wp mono/bifacial)	48 kWp

ACCIONAMIENTO DE GIRO

Tipo de accionamiento	Actuador electromecánico rotativo
Alimentación	Autoalimentado (batería LiFe P04) / Alimentado desde la red
Consumo eléctrico conjunto de accionamiento	< 0.45 kWh/día
Potencia motor	65 W/24 DC

ESPECIFICACIONES MECÁNICAS

Rango de giro	110° (+/-55°)
Velocidad máx. viento (en posición horizontal)	140 kmh/87 mph
Estructura	Acero galvanizado en caliente S235, S275, S355, S350GD, ZM310 o equivalente
Normativa	UL2703 / ASCE7-10 o Eurocódigo
Topografía	15% N-S / 10% E-O en el mismo seguidor Sin límites E-O en seguidores diferentes (Validar para valores más altos)

SISTEMA DE CONTROL

Control de seguimiento	NREL SOLPOS algoritmo astronómico con PLC (Exactitud ±0.001°)
Gestión de sombras	Algoritmo backtracking personalizado
Gestión de viento	Posición de abanderamiento configurable
Estándar de comunicaciones	Modbus RS485 / Modbus Wireless option (Zigbee®)

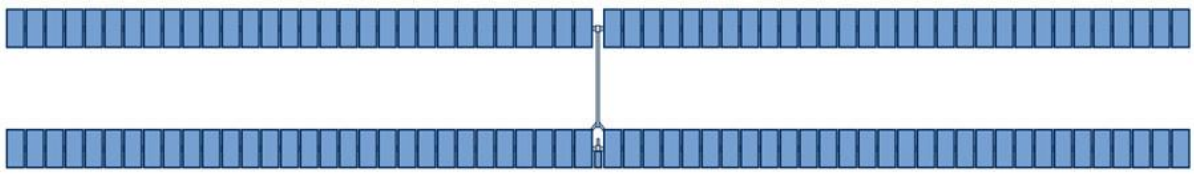
MANTENIMIENTO

Mantenimiento	Revisión anual

GARANTÍA

Estructura	10 años
Accionamiento y motor	5 años

(*) Configurable según proyecto. Disponibles otras opciones.



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SCHEDA TECNICA PANNELLO FV

Preliminary

Mono Multi Solutions

Vertex

BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

PRODUCT: TSM-DEG21C.20

PRODUCT RANGE: 635-660W

660W+
MAXIMUM POWER OUTPUT

0~+5W
POSITIVE POWER TOLERANCE

21.2%
MAXIMUM EFFICIENCY

High customer value

- Lower LCOE (Levelized Cost Of Energy), reduced BOS (Balance of System) cost, shorter payback time
- Lowest guaranteed first year and annual degradation;
- Designed for compatibility with existing mainstream system components
- Higher return on Investment

High power up to 660W

- Up to 21.2% module efficiency with high density interconnect technology
- Multi-busbar technology for better light trapping effect, lower series resistance and improved current collection

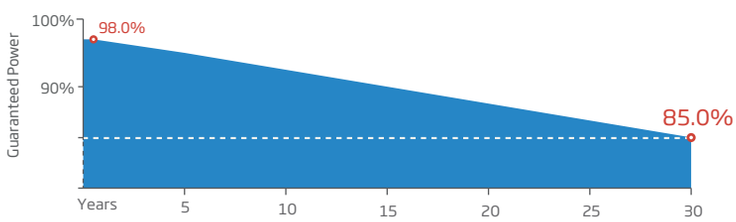
High reliability

- Minimized micro-cracks with innovative non-destructive cutting technology
- Ensured PID resistance through cell process and module material control
- Resistant to harsh environments such as salt, ammonia, sand, high temperature and high humidity areas
- Mechanical performance up to 5400 Pa positive load and 2400 Pa negative load

High energy yield

- Excellent IAM (Incident Angle Modifier) and low irradiation performance, validated by 3rd party certifications
- The unique design provides optimized energy production under inter-row shading conditions
- Lower temperature coefficient (-0.34%) and operating temperature
- Up to 25% additional power gain from back side depending on albedo

Trina Solar's Vertex Bifacial Dual Glass Performance Warranty



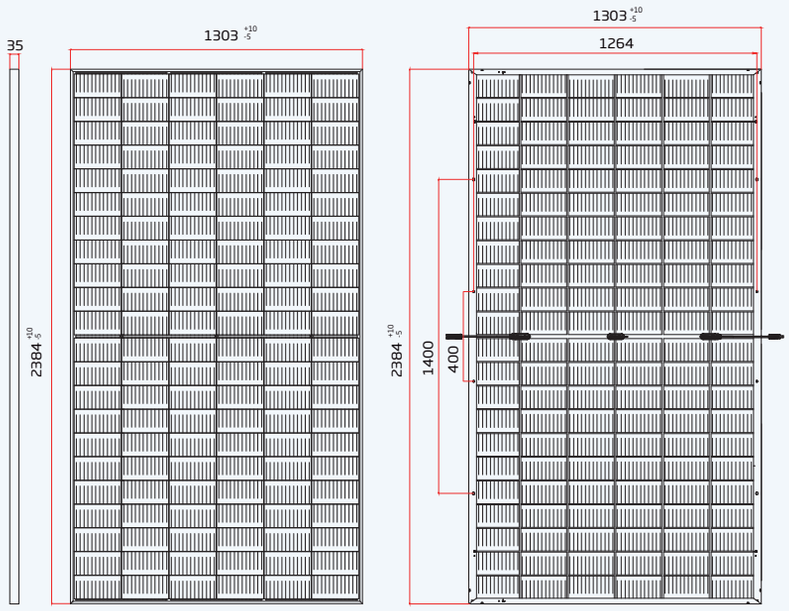
Comprehensive Products and System Certificates

IEC61215/IEC61730/IEC61701/IEC62716/UL61730
ISO 9001: Quality Management System
ISO 14001: Environmental Management System
ISO14064: Greenhouse Gases Emissions Verification
ISO45001: Occupational Health and Safety Management System

Trinasolar

Vertex BIFACIAL DUAL GLASS MONOCRYSTALLINE MODULE

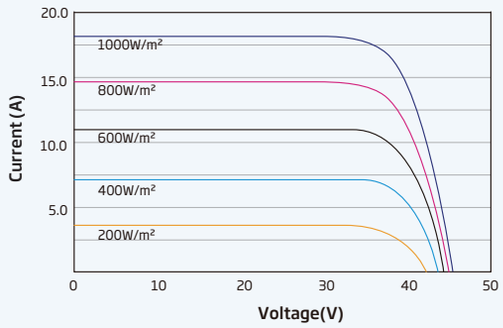
DIMENSIONS OF PV MODULE(mm)



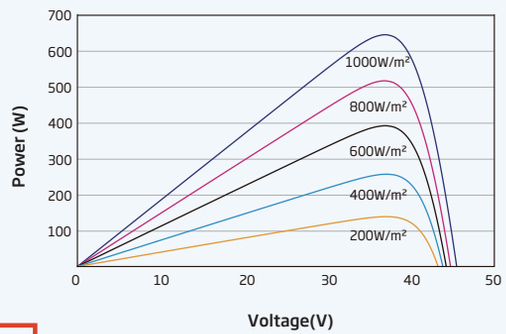
Front View

Back View

I-V CURVES OF PV MODULE(650 W)



P-V CURVES OF PV MODULE(650 W)



Preliminary

ELECTRICAL DATA (STC)

Peak Power Watts-PMAX (Wp)*	635	640	645	650	655	660
Power Tolerance-PMAX (W)	0 ~ +5					
Maximum Power Voltage-VMPP (V)	37.1	37.3	37.5	37.7	37.9	38.1
Maximum Power Current-IMPP (A)	17.15	17.19	17.23	17.27	17.31	17.35
Open Circuit Voltage-VOC (V)	44.9	45.1	45.3	45.5	45.7	45.9
Short Circuit Current-ISC (A)	18.21	18.26	18.31	18.35	18.40	18.45
Module Efficiency η m (%)	20.4	20.6	20.8	20.9	21.1	21.2

STC: Irrdiance 1000W/m2, Cell Temperature 25°C, Air Mass AM1.5. *Measuring tolerance: ±3%.

Electrical characteristics with different power bin (reference to 10% Irradiance ratio)

Total Equivalent power -PMAX (Wp)	680	685	690	696	701	706
Maximum Power Voltage-VMPP (V)	37.1	37.3	37.5	37.7	37.9	38.1
Maximum Power Current-IMPP (A)	18.35	18.39	18.44	18.48	18.52	18.56
Open Circuit Voltage-VOC (V)	44.9	45.1	45.3	45.5	45.7	45.9
Short Circuit Current-ISC (A)	19.48	19.54	19.59	19.63	19.69	19.74
Irradiance ratio (rear/front)	10%					

Power Bifaciality:70±5%.

ELECTRICAL DATA (NOCT)

Maximum Power-PMAX (Wp)	480	484	488	492	495	499
Maximum Power Voltage-VMPP (V)	34.6	34.7	34.9	35.1	35.2	35.4
Maximum Power Current-IMPP (A)	13.90	13.94	13.98	14.01	14.05	14.10
Open Circuit Voltage-VOC (V)	42.3	42.5	42.7	42.9	43.0	43.2
Short Circuit Current-ISC (A)	14.67	14.71	14.75	14.79	14.83	14.87

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Monocrystalline
No. of cells	132 cells
Module Dimensions	2384×1303×35 mm (93.86×51.30×1.38 inches)
Weight	38.7 kg (85.3 lb)
Front Glass	2.0 mm (0.08 inches), High Transmission, AR Coated Heat Strengthened Glass
Encapsulant material	POE/EVA
Back Glass	2.0 mm (0.08 inches), Heat Strengthened Glass (White Grid Glass)
Frame	35mm(1.38 inches) Anodized Aluminium Alloy
J-Box	IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm² (0.006 inches²), Portrait: 280/280 mm(11.02/11.02 inches) Landscape: 1400/1400 mm(55.12/55.12 inches)
Connector	MC4 EVO2 / TS4*

*Please refer to regional datasheet for specified connector.

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	43°C (±2°C)
Temperature Coefficient of PMAX	- 0.34%/°C
Temperature Coefficient of VOC	- 0.25%/°C
Temperature Coefficient of ISC	0.04%/°C

MAXIMUMRATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC)
	1500V DC (UL)
Max Series Fuse Rating	35A

WARRANTY

12 year Product Workmanship Warranty

30 year Power Warranty

2% first year degradation

0.45% Annual Power Attenuation

(Please refer to product warranty for details)

Trinasolar

CAUTION: READ SAFETY AND INSTALLATION INSTRUCTIONS BEFORE USING THE PRODUCT.

Version number: TSM_EN_2020_PA2

www.trinasolar.com

SCHEDA TECNICA INVERTER 215 KVA

SUN2000-215KTL-H0
Smart String Inverter

9
MPP Trackers

99.0%
Max. Efficiency

String-level
Management

Smart I-V Curve
Diagnosis Supported

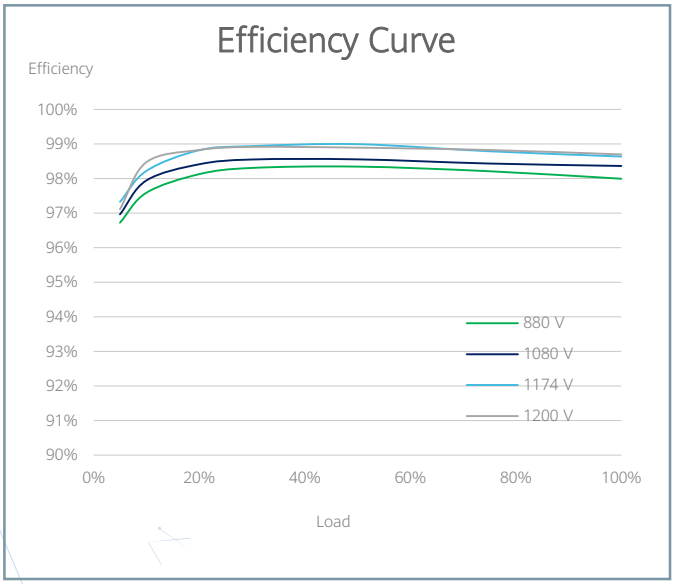
MBUS
Supported

Fuse Free
Design

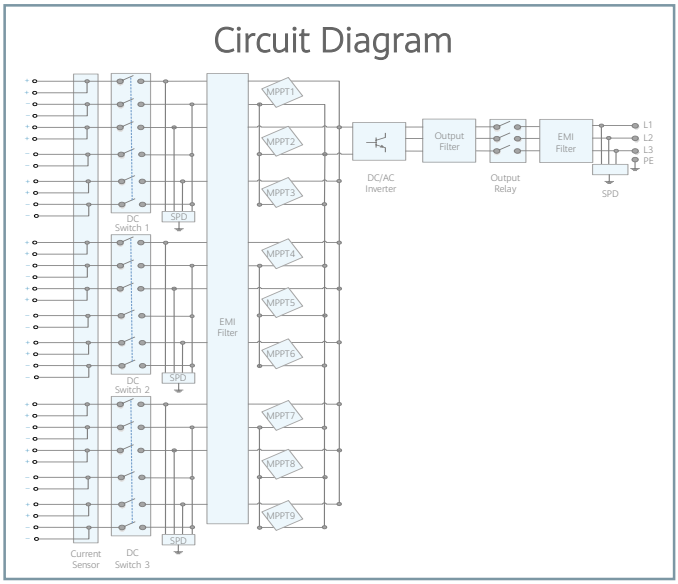
Surge Arresters for
DC & AC

IP66
Protection

Efficiency Curve



Circuit Diagram



SUN2000-215KTL-H0

Technical Specifications

Efficiency	
Max. Efficiency	≥99.00%
European Efficiency	≥98.60%
Input	
Max. Input Voltage	1,500 V
Max. Current per MPPT	30 A
Max. Short Circuit Current per MPPT	50 A
Start Voltage	550 V
MPPT Operating Voltage Range	500 V ~ 1,500 V
Nominal Input Voltage	1,080 V
Number of Inputs	18
Number of MPP Trackers	9
Output	
Nominal AC Active Power	200,000 W
Max. AC Apparent Power	215,000 VA
Max. AC Active Power (cosϕ=1)	215,000 W
Nominal Output Voltage	800 V, 3W + PE
Rated AC Grid Frequency	50 Hz / 60 Hz
Nominal Output Current	144.4 A
Max. Output Current	155.2 A
Adjustable Power Factor Range	0.8 LG ... 0.8 LD
Max. Total Harmonic Distortion	< 1%
Protection	
Input-side Disconnection Device	Yes
Anti-islanding Protection	Yes
AC Overcurrent Protection	Yes
DC Reverse-polarity Protection	Yes
PV-array String Fault Monitoring	Yes
DC Surge Arrester	Type II
AC Surge Arrester	Type II
DC Insulation Resistance Detection	Yes
Residual Current Monitoring Unit	Yes
Communication	
Display	LED Indicators, WLAN + APP
USB	Yes
MBUS	Yes
RS485	Yes
General	
Dimensions (W x H x D)	1,035 x 700 x 365 mm (40.7 x 27.6 x 14.4 inch)
Weight (with mounting plate)	≤86 kg (189.6 lb.)
Operating Temperature Range	-25°C ~ 60°C (-13°F ~ 140°F)
Cooling Method	Smart Air Cooling
Max. Operating Altitude without Derating	4,000 m (13,123 ft.)
Relative Humidity	0 ~ 100%
DC Connector	Staubli MC4 EVO2
AC Connector	Waterproof Connector + OT/DT Terminal
Protection Degree	IP66
Topology	Transformerless

SCHEDA TECNICA CAVI MT

Energia - Applicazioni terrestri e/o eoliche
Power - Ground and/or wind farm applications

RG7H1R EPRO-SETTE™

Unipolare da 1,8/3 kV a 26/45 kV / *Single core from 1,8/3 kV to 26/45 kV*

Unipolare da 1,8/3 kV a 45 kV / *Single core from 1,8/3 kV to 45 kV*

Dati costruttivi / *Construction charact.* - 18/30 kV

sezione nominale *conductor cross-section* (mm²)	diametro indicativo conduttore *approximate conductor diameter* (mm)	spessore isolante *insulation thickness* (mm)	diametro esterno massimo *maximum outer diameter* (mm)	peso indicativo del cavo *approximate weight* (kg/km)	raggio minimo di curvatura *minimum bending radius* (mm)
35	7,0	8,0	34,6	1290	450
50	8,2	8,0	34,8	1390	450
70	9,9	8,0	36,6	1660	480
95	11,6	8,0	38,3	1940	500
120	13,1	8,0	39,8	2230	520
150	14,4	8,0	41,2	2520	540
185	16,1	8,0	43,4	2960	570
240	18,5	8,0	45,8	3560	600
300	21,1	8,0	48,5	4240	640
400	23,9	8,0	51,3	5120	680
500	27,1	8,0	55,3	6300	730
630	30,7	8,0	59,8	7790	790

Caratt. elettriche / *Electrical charact.* - 18/30 kV

sezione nominale *conductor cross-section* (mm²)	posa in aria: in piano *open air installation: flat* (A)	posa in aria: a trifoglio *trefoil* (A)	posa interrata: in piano, p=1 °C m/W *underground installation: flat, p=1 °C m/W* (A)	posa interrata: a trifoglio, p=1 °C m/W *underground installation: trefoil, p=1 °C m/W* (A)	posa interrata: in piano, p=2 °C m/W *underground installation: flat, p=2 °C m/W* (A)	posa interrata: a trifoglio, p=2 °C m/W *underground installation: trefoil, p=2 °C m/W* (A)
35	211	191	187	181	146	142
50	253	229	222	214	172	166
70	316	285	272	263	210	203
95	386	347	325	314	250	242
120	445	400	370	358	283	275
150	505	452	413	400	315	306
185	580	520	467	453	355	345
240	680	614	539	525	408	398
300	775	704	606	593	457	448
400	895	815	684	671	514	506
500	1030	943	775	761	580	572
630	1170	1085	874	860	650	644

Dati costruttivi / *Construction charact.* - 26/45 kV

70	9,9	10,0	42,2	2010	550
95	11,6	10,0	44,3	2360	580
120	13,1	10,0	45,9	2660	600
150	14,4	9,0	45,1	2810	590
185	16,1	9,0	46,9	3220	620
240	18,5	9,0	49,3	3840	650
300	21,1	9,0	52,6	4590	690
400	23,9	9,0	55,1	5440	730
500	27,1	9,0	59,1	6640	780
630	30,7	9,0	63,3	8150	840

Caratt. elettriche / *Electrical charact.* - 26/45 kV

70	318	285	264	256	205	199
95	385	346	315	305	243	237
120	443	398	358	348	275	269
150	502	449	400	389	305	299
185	576	516	451	441	344	338
240	675	609	520	511	395	390
300	769	698	585	575	442	438
400	881	807	661	654	498	495
500	1014	933	742	739	557	558
630	1178	1069	848	836	635	630

SCHEDA TECNICA STORAGE

Narada®
An Expert of Energy Storage Solutions

Battery Energy Storage System(BESS)

NESP NWI (None-Walk-In) Series

Zhejiang Narada Power Source Co., Ltd.

East Wing, No.822 Wen'er West Road, Hangzhou, Zhejiang, China.
Tel (+86-571) 56975980 Email intl@narada.biz .
Fax (+86-571) 56975955 Website www.naradapower.com

A Reliable and Promising Energy Storage Solution for Smart Grid

Global Innovative

Narada®

Green Responsible

Being global, innovative, green and responsible is our core strategy. We are dedicated to achieve harmonious co-existence and sustainable development between enterprise and environment.

As a leader in ESS industry, Narada is devoted to build a smart energy network based on micro-grid and distributed energy storage solution.

- President of Narada

Introduction

Zhejiang Narada Power Source Co., Ltd. was established in 1994 and has been public listed in Shenzhen Stock Exchange Market since 2010. Narada is specialized in providing energy system integration products, solutions and operation services to Information and Communication Technology (ICT), Renewable Energy Storage, Electric Vehicle (EV) and other energy saving and environmental protection applications. With the development in decades, Narada has become the leader in global industrial batteries section, and “Narada” brand has been the famous and well-known brand in all over the world.

Corporate Culture

Vision

SMART ENERGY
WONDERFUL GREEN LIFE

Value

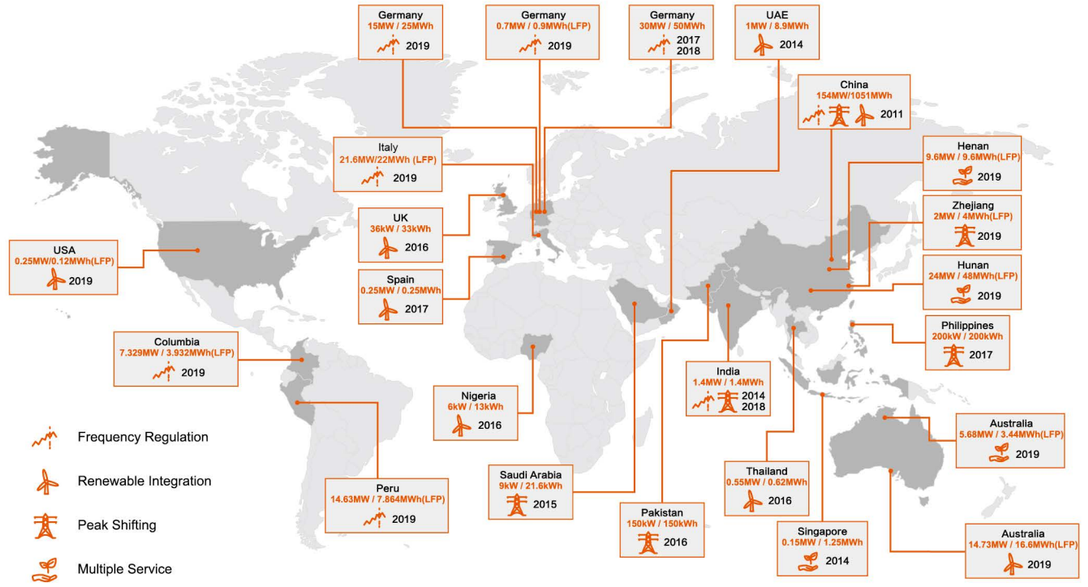
Credibility | **Responsibility** | **Creativity** | **Devotion**

Global Presence

Distribution in Over 158 Countries

Narada Branches

Global Installations



Milestones

First Island Project
Zhejiang , China
200kW/560KWh
Lead Carbon

2010

2011

First BESS jointly with Solar in China
Narada First BESS Trial Project in 2011
Narada factory
500kW/2MWh
Lead Carbon & Lithium Battery

First Ramping Rate Control Project with Wind
Jiangsu, China
2.5MW/1.87MWh
Lead Carbon

2013

2014

First Oversea Project
Singapore
30kW/250kWh
Lead Carbon

India First Frequency Regulation Project
India PGCIL
1MW/1MWh
Lead Carbon & Lithium Battery

Largest Solar BESS project for Telecom Operator
Abu Dhabi, United Arab Emirates
1MW/8.86MWh
REX

Largest Energy Quality, Demanding Response & Arbitrage Solution
Tiangong Group – Jiangsu, China
12.5MW/100MWh
Lead Carbon

First Containerized Lithium Solution for Solar Out of China
Chiengmai, Thailand
500kW/500kWh
Lithium Battery

First Energy Shifting & Arbitrage Project
GCL– Zhejiang, China
1.5MW/12MWh
Lead Carbon

2016

2017

First Large BESS Project in Africa
Nigeria & Tanzanian
3MW/14MWh
Lead Carbon

Largest Project for Distribution Upgrade Deferral & Voltage Support
WuXi Industry Zoon
20MW/160MWh
Lead Carbon

First Lithium Project for Distribution Upgrade Deferral
Henan China
9.6MW/9.6MWh
Lithium Battery

First & Largest Frequency Regulation Project
Germany
30MW/50MWh
Lead Carbon

NARADA AWARDED TECH DRIVER GLOBAL LENDING BET PACIFICT CORE AS OF 2019 DCTI

2018

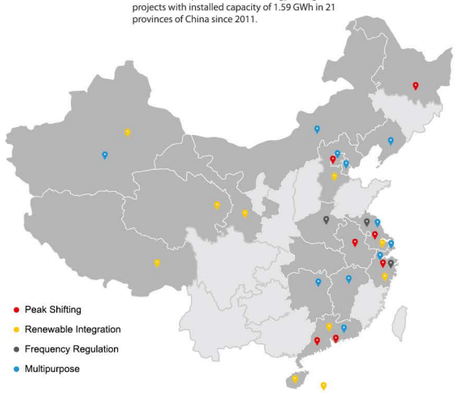
2019

UL 9540, UL 1973, IEC 62619 Certified
NESP LFP SS-40AS MW Scale Containerized BESS

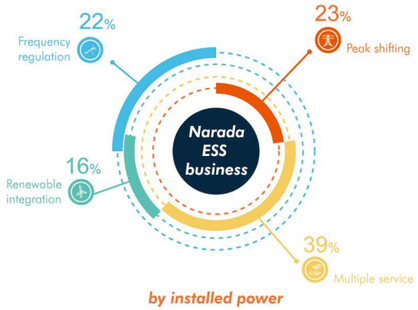
First VPP project for C&I Application
Germany
360kW/240kWh per Site, 12 Sites in total
Lithium Battery

First BESS Project with the Largest Energy Capacity per Single Container in China
Henan China
24MW/48MWh
Lithium Battery

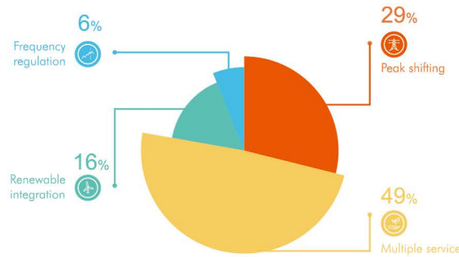
Narada has implemented 110 + energy storage projects with installed capacity of 1.59 GWh in 21 provinces of China since 2011.



- Jiangsu (18 sites) 62.7MW/494.4MWh
- Jiangsu (10 sites) 39.9MW/313.6MWh
- Jiangsu (3 sites) 0.3MW/2.1MWh
- Jiangsu (2 sites) 0.5MW/0.7MWh
- Hunan 24MW/48MWh（LFP）
- Qinghai (3 Sites) 15.5MW/122MWh
- Guangdong (4 sites) 5MW/20.5MWh
- Guangdong (2 sites) 0.95MW/3.8MWh
- Guangdong 0.5MW/1.5MWh
- Zhejiang (5 sites) 3.1MW/6.4MWh
- Zhejiang (6 sites) 3MW/18.1MWh
- Zhejiang 0.2MW/0.4MWh
- Zhejiang 2MW/4MWh（LFP）
- Henan 9.6 MW/9.6MWh（LFP）
- Beijing (5 sites) 1MW/5.3MWh
- Beijing (2 sites) 0.5MW/3MWh
- Hebei (3 Sites) 2.1MW/12.5MWh
- Hubei 1.5MW/9MWh
- Xinjiang (2 sites) 2MW/4MWh
- Xinjiang 0.1MW/1MWh
- Liaoning (5 Sites) 0.5MW/3.8MWh
- Shenzhen 0.5MW/2.9MWh
- Xizang 0.35MW/2.8MWh
- Inner Mongolia (2 Sites) 1.1MW/2.6MWh
- Heilongjiang (2 Sites) 0.33MW/2.6MWh
- Gansu 0.32MW/1.8MWh
- Shanghai (3 Sites) 0.1MW/1.1MWh



by installed power



by installed capacity

Cell Technology

1.Lithium Iron Phosphate

Best Lithium Option for BESS;
The safest Lithium technology for BESS

2.Stacking plates

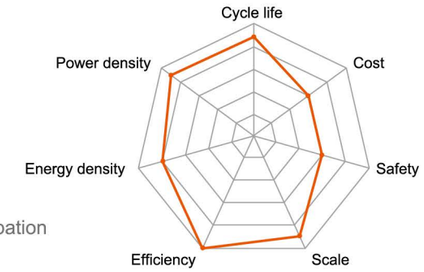
Stacking plates is good for high power operation and thermal dissipation

3.Prismatic Cell

Multi-layered Protection at cell level

4.Aluminum Case

Excellent Thermal Conductivity and Cooling Performance;
Safe and efficient heat release from inside to outside



Module

Rack

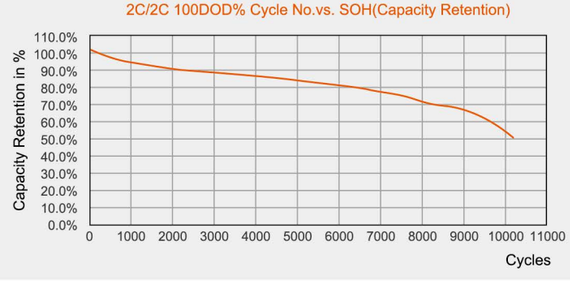
Sustainable Design

Continuously innovating to increase the energy density while maintaining the same form factor and cell dimensions, thus facilitating future upgrades to higher capacity, higher energy density, ESS with no change to pack design.

Cell Model		FE80B	FE105A	FE125A	Unit
Weight		2.20	2.30	2.35	kg
Dimensions	Length	130			mm
	Width	36			mm
	Height	240			mm
Nominal Capacity		86	105	130	Ah
Nominal Voltage		3.2			V
Allowed C-Rate		2	2	1	C
Recommended C-Rate		2	1	0.5	C

Long Life and Wide Application & Experience

Wide application & experience on Telecom, BESS and Automotive, collecting knowhow and innovating superior and adaptive technology.



Long Cycle life
2000 cycles @90%SOH
6000 cycles @80%SOH
8000 cycles @70%SOH

Wide application & experience
Telecom since 2010
BESS since 2011
Automotive since 2012

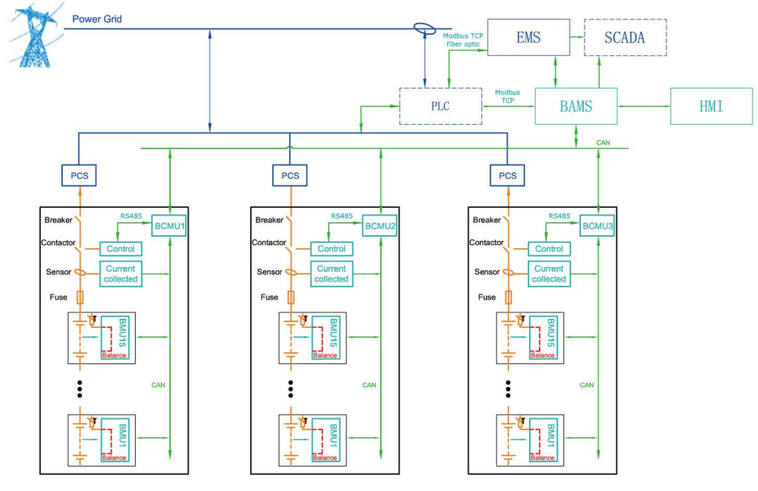
Features of Module & Rack Design

1. Platform Design for Energy, Medium and Power Solutions
2. 0.5C to 2C options available for Frequency regulation, Peak Shaving, Energy Reserve, etc
3. The Highest Energy density for LFP Energy Solution to optimize footprint and BOP cost
4. Passive & Active Thermal Ventilation System, Designed in both Module & Rack
5. Particular Considering for Containerized solution with proper aisle space
6. The Highest Lifetime Performance for Energy Storage System
7. Tested and Listed to UL and IEC Standard for Safety

BMS

BMS Function

1. Battery working condition Monitoring
2. State of Charge (SOC) estimation
3. State of Health (SOH) estimation
4. Discharge Control
5. Thermal Management
6. Fault Diagnosis Alarm
7. Information Monitor
8. Balance
9. Protection



NESP Containerized Solution

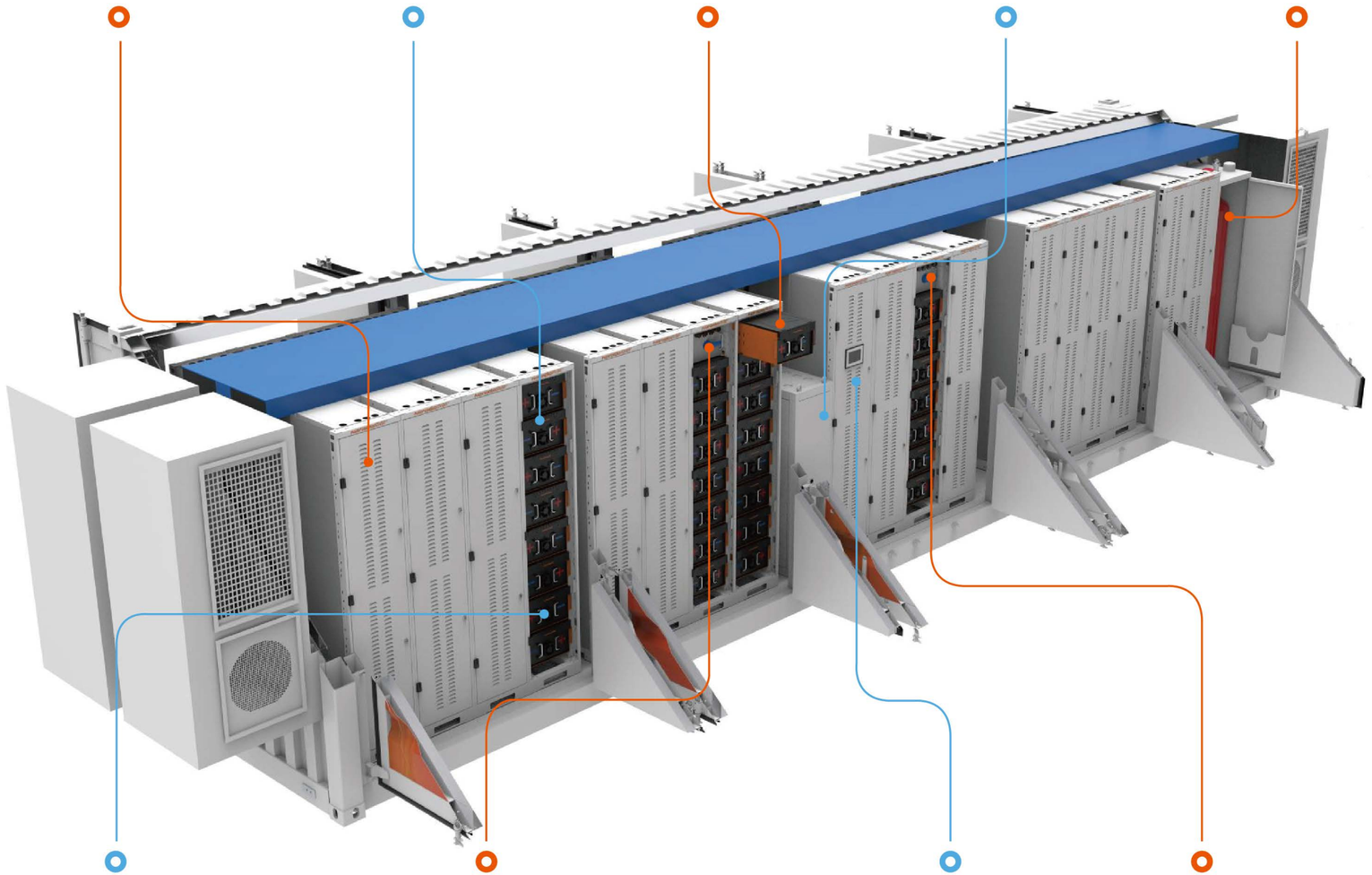
Rack

LFP Cell

Module

DC Panel

Fire Suppression System



Module BMS (BMU)

Rack BMS (BCMU)

System BMS (BAMS)

Battery Protection Unit (BPU)

COMPLETED NESP BESS

D.C.System

- Cell
- Module
- Rack
- BMS (Module, Rack, System)
- Battery Protection Unit
- Container
- DC Panel
- HVAC System
- Fire Suppression System

A.C.System

PCS Partner List: Siemens, SMA, Sungrow, etc.

KPI for choosen: Country Certificate, Product Type, System Cost, Client Requirement, etc

NESP Module & Rack Specification

Item		Module	Rack Type 1	Rack Type 2	Rack Type 3
Type No.		76.8NESP160	76880135	76880160	76880184
Cell Capacity	Ah	160	160	160	160
Energy	kWh	12.3	135	160	184
Nominal Volt	V	76.8	844.8	998.4	1152.0
Minimum Volt	V	67.2	739.2	873.6	1008.0
Maximum Volt	V	86.4	950.4	1123.2	1296.0
Dimension (W x D x H)	mm	400*884*265	500*938*1860 (2 pcs)	500*938*2130 (2 pcs)	500*938*2400 (2 pcs)
Weight	kg	110.7	1597.7	1859.1	2120.5

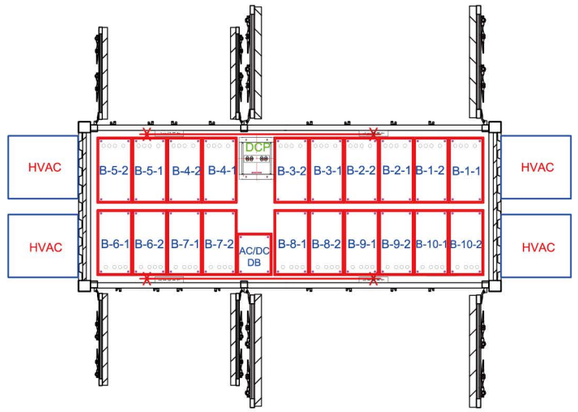
Item		Module	Rack Type 1	Rack Type 2	Rack Type 3
Type No.		76.8NESP200	768100169	768100200	768100230
Cell Capacity	Ah	200	200	200	200
Energy	kWh	15.4	169	200	230
Nominal Volt	V	76.8	844.8	998.4	1152.0
Minimum Volt	V	67.2	739.2	873.6	1008.0
Maximum Volt	V	86.4	950.4	1123.2	1296.0
Dimension (W x D x H)	mm	400*884*265	500*938*1860 (2 pcs)	500*938*2130 (2 pcs)	500*938*2400 (2 pcs)
Weight	kg	133.5	1848.5	2155.5	2462.5

Item		Module	Rack Type 1	Rack Type 2	Rack Type 3
Type No.		76.8NESP250	768125211	768125250	768125288
Cell Capacity	Ah	250	250	250	250
Energy	kWh	19.2	211	250	288
Nominal Volt	V	76.8	844.8	998.4	1152.0
Minimum Volt	V	67.2	739.2	873.6	1008.0
Maximum Volt	V	86.4	950.4	1123.2	1296.0
Dimension (W x D x H)	mm	400*884*265	500*938*1860 (2 pcs)	500*938*2130 (2 pcs)	500*938*2400 (2 pcs)
Weight	kg	141	1931	2253	2575

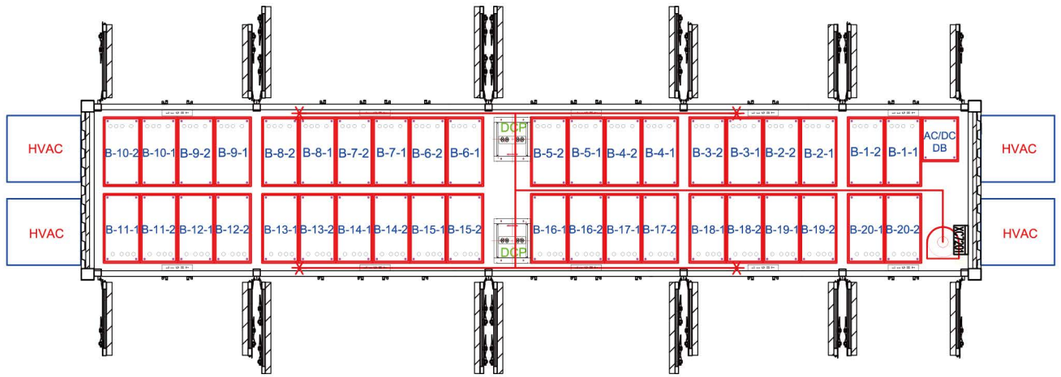
System Specification

System Characteristics									
Battery Type	Lithium-Ion		LFP						
Energy Rating	DC Nominal Energy	MWh	2.88	2.30	1.84	5.76	4.61	3.69	Energy @ C/2 Rate
	Discharge C-Rate	C	0.5	1.0	2.0	0.5	1.0	2.0	Up to 2C
Power Rating	Rated Power	MW	1.44	2.30	3.69	2.88	4.61	7.37	
Battery Voltage	Nominal Voltage	Vdc	1152						at Rack
	Voltage Range	Vdc	1008 ~ 1296						at Rack
SOC Range	Recommended Range		5%~95%						
Physical Characteristics									
Container Building	Quantity	pcs	1						
	Dimensions (L x W x H)	ft	20'			40'			ISO HC
	Weight	ton	31.88	30.64	26.88	62.16	59.74	52.41	
System Performance Characteristics									
Efficiency	D.C. Round Trip Efficiency	%	95%	94%	93%	95%	94%	93%	C/2 P - 25℃
Aux Power	Max Aux Power	kW	14.4	27.6	51.6	28.8	55.3	103.2	Depends on HVAC
Interconnection Parameters									
Point of Interconnect	PCS A.C. Voltage	Vac	Customized						
	POI Voltage	kV	Customized						
	A.C. Frequency	Hz	50Hz/60Hz						
Environmental Characteristics									
Environment conditions	Operating Temperature	℃	-40 ℃ to 60 ℃						Maximium
	Storage Temperature	℃	10 ℃ to 30 ℃						Optimium
Relative Humidity	Maximum Humidity	%	up to 95%						
Altitude	Above Sea Level	m	2000m / 600ft						
Applications									
Ancillary Service, Peak shaving, Demanding Response, Ramping Rate Control, Energy Shifting, etc									

General Layout of Containerized Solution



0.5C	1.0C	2.0C
20ft ISO HC Container External Mounted HVAC Max Rack Enery 288kWh Max Container Energy 2.88MWh Rated Power 1.44MW	20ft ISO HC Container External Mounted HVAC Max Rack Enery 230kWh Max Container Energy 2.30MWh Rated Power 2.30MW	20ft ISO HC Container External Mounted HVAC Max Rack Enery 184kWh Max Container Energy 1.84MWh Rated Power 3.69MW



0.5C	1.0C	2.0C
40ft ISO HC Container External Mounted HVAC Max Rack Enery 288kWh Max Container Energy 5.76MWh Rated Power 2.88MW	40ft ISO HC Container External Mounted HVAC Max Rack Enery 230kWh Max Container Energy 4.61MWh Rated Power 4.61MW	40ft ISO HC Container External Mounted HVAC Max Rack Enery 184kWh Max Container Energy 3.69MWh Rated Power 7.37MW

Codes & Standards

Safety	
UL 9540	Safety for Energy Storage Systems and Equipment
UL 9540A	Test Methods for Evaluating Thermal Runaway Fire Propagation - BESS
UL 1973	Batteries for Use in Stationary Applications
UL 1642	Standards for Lithium Batteries
IEC 62619	Safety for Secondary Lithium Cells and Batteries
IEC 61508, UL 991, UL 1998, UL60730-1	Functional Safety for Electrical Systems
NFPA 70E	Standard for Electrical Safety in the Workplace
NFPA 70	(NEC) National Electrical Code
ANSI/IEEE C-2	National Electric Safety Code
UL 60950	Electrical Insulation
NFPA 551 / NFPA 550	Fire Detection and Suppression
IEC 60812	Safety Analysis and Control System (FMEA, FTA)
IEC 61025	
MIL-STD-1629A	
UL1778	UPS for Ancillary
UL1598	Luminaire
UL8750	
UL1012	Rectifier for D.C. power supply
UL1995	Air conditioner for cooling
UN 38.3 / IEC 62281	Transportation Safety of Lithium metal and lithium ion batteries
Performance Standards & Grid Interconnect	
IEC61427-2 2015	Secondary cells and batteries for renewable energy storage – General requirements and methods of test – Part 2: On-grid applications
IEC 62620	Secondary Lithium Cells and Batteries for Industrial Application
PNNL-22010	Protocal for Measuring Performance of Energy Storage System
UL 1741 (SA)	Standards for Inverters, Converters, Controllers and Interconnection System Equipment
IEEE 1547	Standard for Interconnecting DR WITH EP
ANSI/IEC 60529	Degrees of Protection Provided by Enclosures
NEMA 250	Enclosures for Electrical Equipment
NEMA 250 / UL 50E	Environmental Considerations for Electrical Equipment Enclosures
IEEE 693-2005	Recommended Practice for Seismic Design of Electrical Equipment

Global Track Record

Since 2011, Narada's BESS products have been successfully operating in over 17 countries, ranking Top 2 worldwide in terms of installed capacity according to Bloomberg's statistics and ranking the 1st in China in terms of installed capacity and power according to CNESA..

SINCE
2011

TOTAL
420MW/1.8GWh

COUNTRIES
17

Europe

Germany

45MW / 75MWh

0.7MW / 0.9MWh (LFP)

Italy

21.6MW/22MWh (LFP)

UK

36 kW / 33 kWh

Spain

0.25 MW / 0.25 MWh

Asia pacific

India

1.4 MW / 1.4 MWh

Australia (2 sites)

20.4MW/20MWh (LFP)

Pakistan

150 kW / 150 kWh

Philippines

200 kW / 200 kWh

Thailand

0.55 MW / 0.62 MWh

Singapore

0.15 MW / 1.250 MWh

Saudi Arabia

9 kW / 21.6 kWh

Nigeria

6 kW / 13 kWh

Saudi Arabia

9 kW / 21.6 kWh

UAE

1MW / 8.9MWh (multiple sites)

USA

0.25MW/0.12MWh 2019 (LFP)

China

Jiangsu (35 Sites)

104 MW / 812 MWh

Qinghai (3 Sites)

15.5 MW / 122 MWh

Guangdong (7 Sites)

6.2 MW / 26 MWh

Zhejiang

6.3 MW / 25 MWh

Zhejiang

2 MW / 4 MWh (LFP)

Beijing (7 Sites)

1.5 MW / 18.3 MWh

Henan

9.6 MW / 9.6 MWh (LFP)

Hebei (3 Sites)

2.1 MW / 12.5 MWh

Hubei

1.5 MW / 9 MWh

Xinjiang (3 Sites)

2.1 MW / 5 MWh

Inner Mongolia (2 Sites)

1.1 MW / 2.6 MWh

Hunan

24 MW / 48 MWh (LFP)