Envision

SMART BESS PRODUCT BROCHURE

2024

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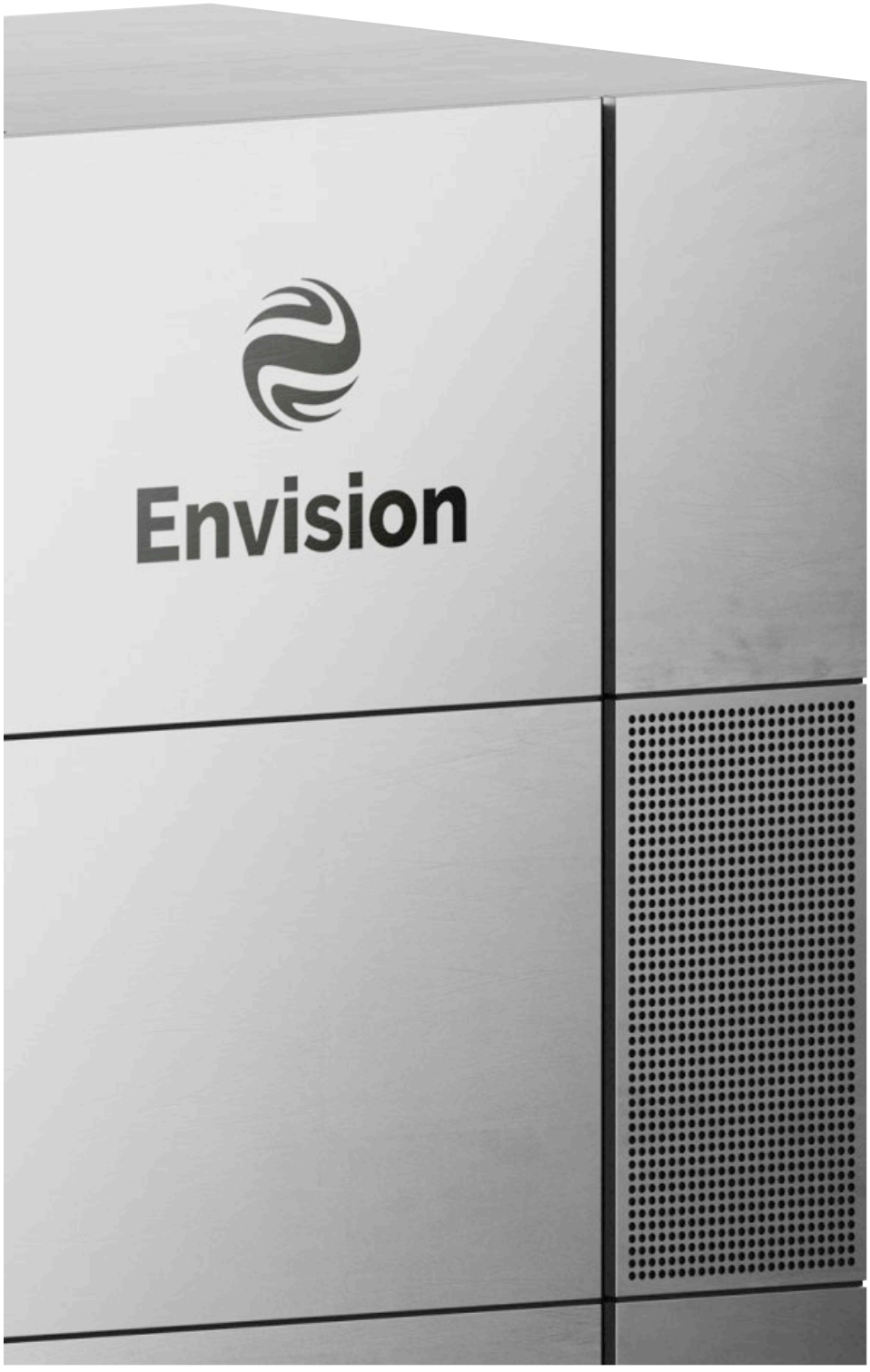
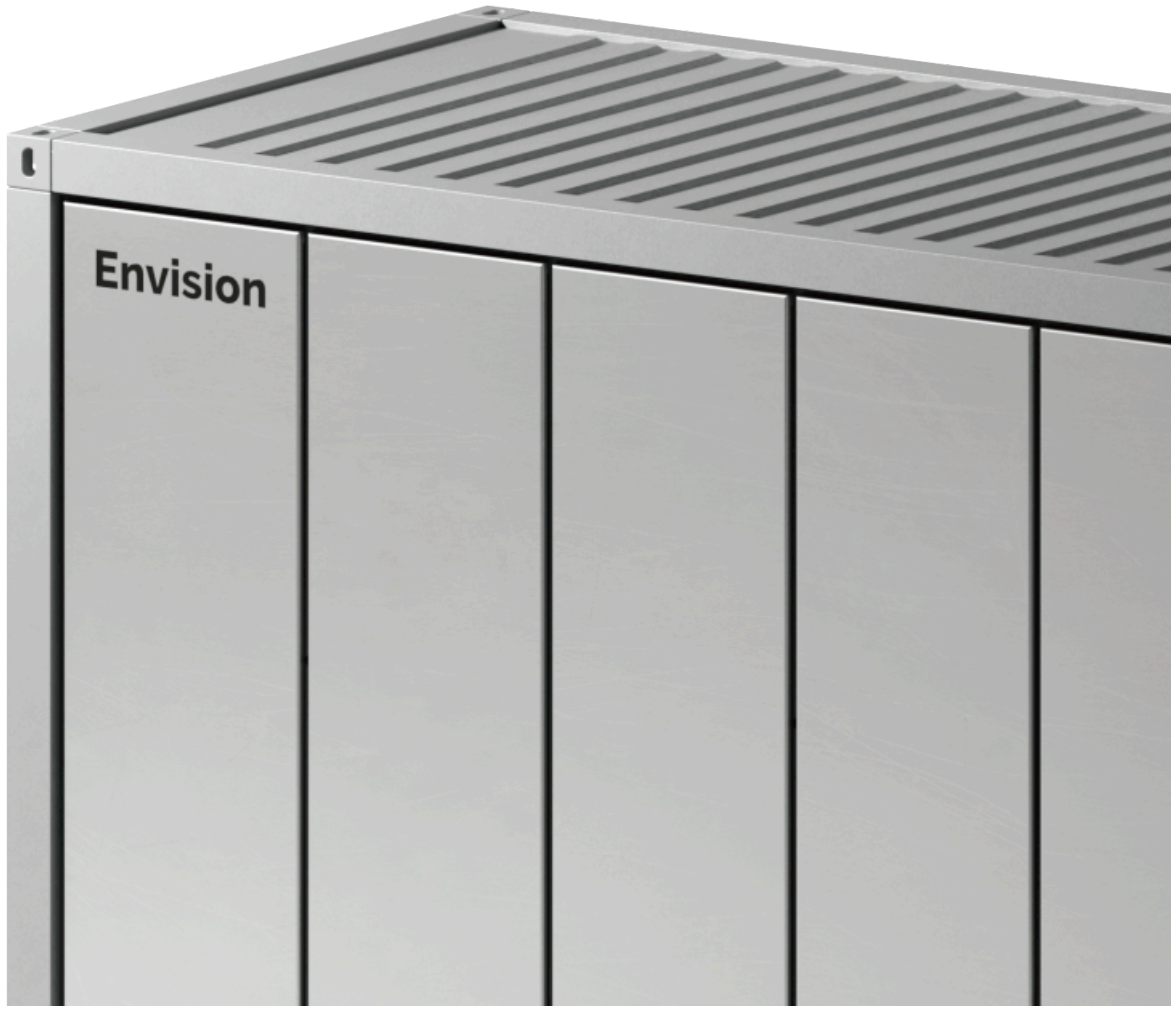




Vertical Integration In-house R&D

BESS' Ultimate Evolutionary Path

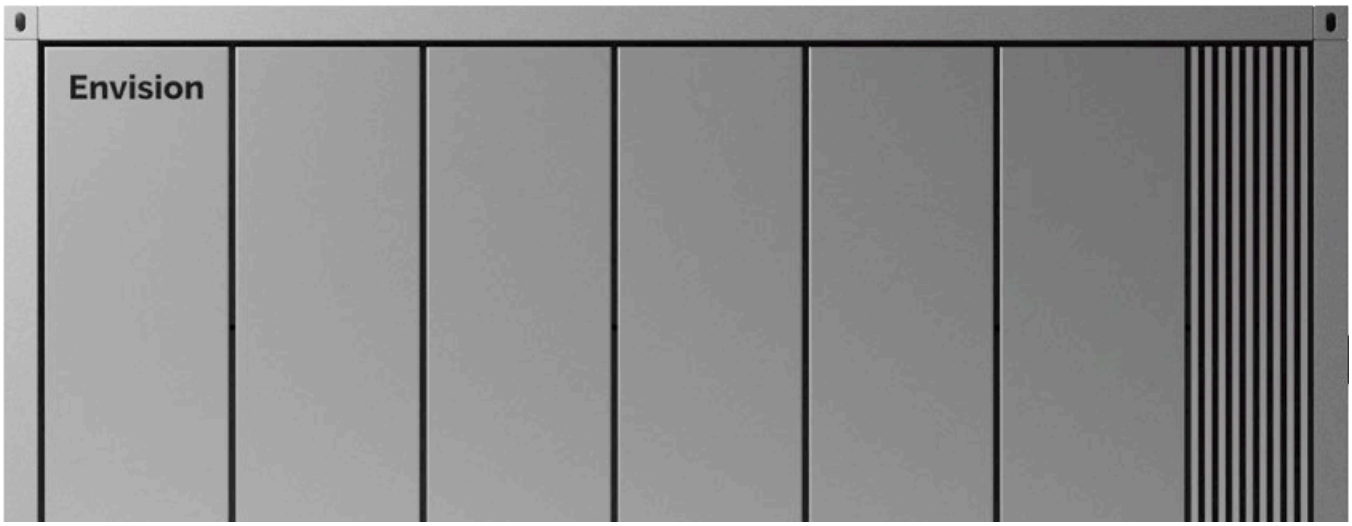
Envision Energy is a global leader green technology and renewable energy solutions. Utilising expertise in wind energy and hydrogen, Envision's battery energy storage systems are developed with a deep understanding of power system requirements.

Envision's exceptional teams combine excellence in research and development with industry leading battery cells, managements systems, power controls and interface solutions that drive the delivery of the energy sector towards net zero.

Service offerings include delivery, installation and commissioning support alongside a full suite of operations and maintenance packages across the life of the assets to maximise asset performance and returns customers.

Envision's vertically integrated approach and in-house R&D promotes:

- Technological innovation and agility across the supply chain to accelerate product advancement
- Exceptional quality at all stages of design and manufacturing leading to superior product delivery
- Optimisations across all product and system levels to ensure safe, reliable and productive performance



Outstanding Global Companies Providing Integrated Solutions

Envision Energy, a global leading enterprise in smart wind energy, smart ESS technology and green hydrogen solutions.

Delivering energy projects across the globe including Africa, Asia, Australasia, Europe, Middle East and South America

World leading battery technology

Envision Energy only supplies tier 1, industry leading proven batteries developed with automative grade processes and safety systems

Owns the world's most comprehensive decarbonisation platform powered by AI technology

Manages over 560 GW of energy assets worldwide
Connects 220 million smart devices

Understanding Energy

Exceptional expertise with system integration and power electronics technology capabilities

Understanding Battery Cells

Core controlled battery cells with systems management technologies and an exemplary safety track record

Smart Collaboration

Seamless integration with grid ecosystems, natural advantages in production and sales, integrated solutions turned into savings

World-Leading BESS Integrator

Continuous Innovation Integrated Solutions

Gen 4

390 Wh/L
180 Wh/kg

Container Solution
315 Ah

2024 Q2

Specification: Industry leading 315 Ah LFP energy storage dedicated cells, 12000 cycles, 5 MWh in 20ft single box

Safety: Triple fire safety system + advanced analytics fire monitoring

Gen 3

380 Wh/L
175 Wh/kg

Cabinet Solution
305 Ah

2021Q2

Specification: Industry leading 305 Ah LFP energy storage dedicated cells, 10000 cycles, modular liquid cooling 406 kWh / 7.3 MWh

Safety: Distributed pack level Perfluorohexanone fire protection system

Gen 2

330 Wh/L
150 Wh/kg

T48×L173×H170
150 Ah

2019 Q2

Specification: Industry leading 150 Ah LFP energy storage dedicated cells, 6000 cycles, 1500 V-6.7 MWh container energy storage products

Safety: Heptafluoropropane fully submerged fire protection system

Gen 1

280 Wh/L
140 Wh/kg

T48×L173×H170
120 Ah

2018 Q1

Specification: Industry leading 120 Ah LFP energy storage dedicated cells, 5000 cycles, 1000 V-2.5 MWh container energy storage products

Safety: Aerosol fully submerged fire protection system

Vertical Intergration
In-house R&D

Envision's liquid cooling Smart BESS products are designed and tested using in-house R&D capabilities. We combine nearly 20 years of experience in wind turbine electrical systems and grid integration with global team of experts to fully optimise energy storage products and systems – from the cells to product design, control systems and interfaces, through to lifetime operations.

Envision always ensures quality and safety is at the forefront of all decisions.

As the demand for BESS accelerates across the world, Envision is continuously developing and improving products and services to ensure together we can bring solutions to the industry whilst meeting client's technical, environmental, social and economic challenges.

Battery Cells Developed for Energy Storage

Larger capacity and improved performance

1 cell	1 KWh
3 years	0 attenuation
Existing system	Compatible
Capacity	315 Ah
Energy	1008 Wh
Cycles	12000
Standard sizes	72*173*207

Ultimate Safety

Intrinsic Safety Culture

Cells With 0 Critical Incidents

Envision Energy selected special cells from the industry leading battery supplier for BESS. The products have been delivered to more than 200 BESS projects and have operated for more than 5 million hours. 5 million hours, with zero critical incidents.

Technical Reliability

The use of safe LiFePO4 (LFP) materials and high permeability electrolytes, improves material stability, reduces the initial impedance of cells and reduces the risk of lithium dendrite growth. The balance of systems utilise compact and simplified designs, optimises efficiencies.

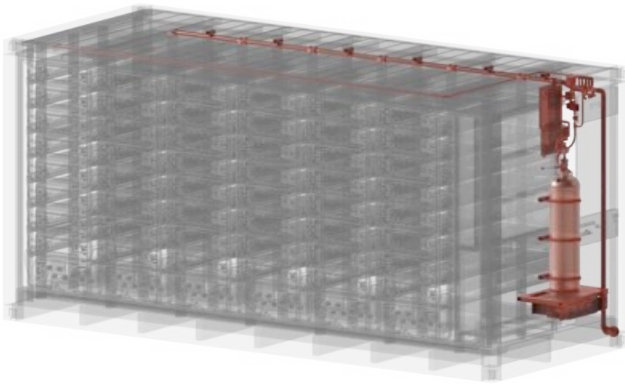
Innovative Collaboration

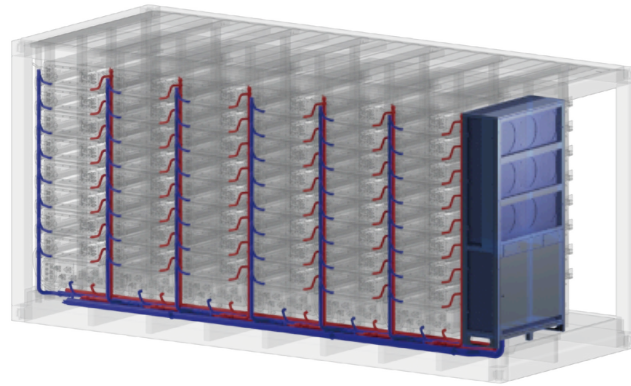
An innovative safety culture is fostered across all product lines, with Envision's global experts and teams pursuing excellence and advancement with material performance, product design, processes and testing. Envision aspires to ensure products and systems are always of superior quality and reliable throughout their operational life.

In combination with Envision's visionary ESG aims and commitments, including net zero and the circular economy, these are combined with products and services that are designed for lifecycle performance and reliability.

Design Safety

Combining nearly 20 years of experience in power electronics design and system integration, Envision's BESS products are designed to ensure hazard prevention is at the heart of all criteria. Included with patented pack-level anti-heat diffusion design, refined liquid cooling, thermal management technology, and products feature a six-tier electrical safety system. These designs cover various failure modes and enacts controls to reduce risks to improve the entire safety system.





Process Safety

Ensuring the safety of the energy storage system throughout its life is of paramount importance to Envision. Cloud-based advanced analytics software employs advanced machine learning, alongside deep battery expertise to provide an additional layer of safety through predictive diagnostics, helping to reduce unplanned downtime and minimise risk. In addition, innovative analytical tools provide the user with a granular breakdown of a site's performance, allowing for the optimisation of its operation, extending asset lifetime and increasing efficiency.

Fire Safety

Envision utilises a range of passive and active techniques to reduce the risk of critical safety incidents. Envision's battery solutions are equipped with smoke detectors, heat detectors, and combustible gas detectors to swiftly identify potential risks of battery or electrical fires.

Envision's storage systems deploys a clean agent suppressant compliant with NFPA standards. In the event of a safety risk, every IP67 pack is sprayed to flood the threat; absorb the heat, extinguish any present flames and reduces temperature to a stable level.

The active exhaust ventilation and deflagration venting system are designed to NFPA 69 and 68. Water sprinkler system is offered as an option with pre-installed dry pipes. Using the safer Lithium Iron Phosphate cells and having advanced liquid cooling systems, Envision's AI IoT software continuously monitors cells to detect issues before they become critical.

Advanced prognostics and health insights harness a combination of analytical and machine-learning based methods to proactively address potential failures as early as possible.

Global Ambitions

Delivering Envision's technology to global customers

Envision continues to expand its global orders and footprint across the world, from manufacturing facilities, R&D centres and offices, providing solutions in new countries to new customers.

Designed for Challenging Environments

Operating in diverse site conditions

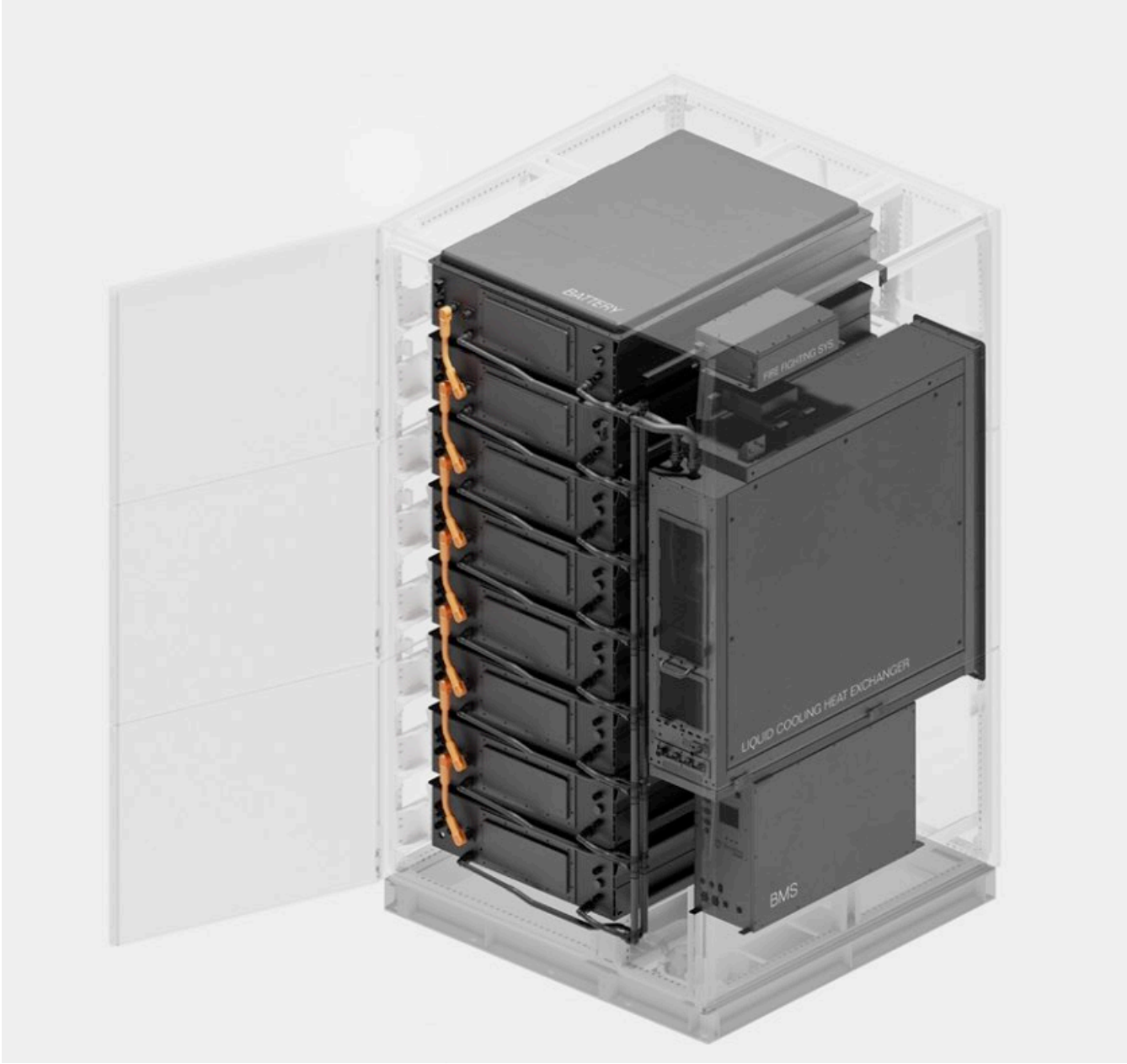
Products are designed to withstand extremes in weather from high temperatures to low, in humid and dry conditions and in costal and desert locations.

Liquid cooling systems have a wider range of operating temperature range -40°C to +50°C. We test systems for weather-resistance to ensure installations can withstand the test of time.

Envision's energy storage systems have been deployed in varied and challenging environments in sites across the globe.

Smart Energy Storage System

Container Products



ENS-L

- **Equipped with industry leading LFP 280 Ah & 305 Ah cells 8000 to 10000 cycles**
- **Modular design - flexible configurations to work with client's capacity & site layouts, suitable for augmentation**
- **Saving on BoP costs with factory pre-installed battery systems that reduce on site activities**
- **Distributed pack-level fire detection with perfluorohexane fire suppression**

	ENS-L-4470	ENS-L-7300	ENS-L-9750
Cell type	LFP 280 Ah	LFP 305 Ah	LFP 305 Ah
Rated capacity of battery system	4470 kWh	7300 kWh	9750 kWh
Number of racks	6 + 6	9 + 9	12 + 12
Voltage range	1165 ~ 1500 V	1165 ~ 1500 V	1165 ~ 1500 V
Charge and discharge time	1 h	2 h	3 to 4 h
Cooling system	Liquid cooling	Liquid cooling	Liquid cooling
Fire safety system	Pack level fire suppression and perfluorohexane fire suppression system, + explosion-proof ventilation + 1 hour fire rating + backup water fire protection (optional)		
Dimensions (l, h, w in mmx no. of units)	9070 x 3200 x 2500	13200 x 3200 x 2500	17440 x 3200 x 2500
Weight (t)	30	40	53
Certification	UL9540A, UL1973, IEC62619, IEC62933	UL9540A, UL1973, IEC 62619, IEC62933	UL9540A, UL1973, IEC62619, IEC62933

Smart Energy Storage System

Cabinet Products

ENS-LC

- **Equipped with industry leading LFP 315 Ah cells**
- **Increased to 12000 cycles, reducing the cost per kWh**
- **Highly integrated design in a 20 ft standard container**
- **Supports side by side layouts, decreasing footprint requirements, allowing for more site design flexibility**
- **Multiple fire safety protection systems + big data fire alarm monitoring with collaborative software and hardware systems to ensure safe and reliable operations**

	ENS-LC10060	ENS-LC20120
Cell type	LFP 315 Ah	LFP 315 Ah
Rated capacity of battery system	10060 kWh	20120 kWh
Voltage range	1165 ~ 1500 V	1165 ~ 1500 V
Charge and discharge time	2 to 4 h	4 h
Cooling system	Liquid cooling	Liquid cooling
Fire safety system	1 hour fire rating of enclosure + independent rack-level fire detection and fire sprinkler + explosion-proof ventilation, backup water fire protection (optional)	
Dimensions (l, h, w in mm)	6058 x 2438 x 2591 x 2	6058 x 2438 x 2591 x 4
Weight (t)	42 x 2	42 x 4
Certification	IEC62619, IEC63056, IEC61000-6-2&6-4, IEC62477-1, IEC62933-5-2, UL1973, UL9540A, UL9540, UN3480 & UN38.3	

Customised Power Electronics Solutions

Technology and Experience derived from wind turbine deployment

With more than 20000 wind turbines installed globally, Envision has over decade of operational experience with power electronics. Envision's AI and IoT software tools combined with deep domain experience have been harnessed to design power electronic solutions for energy storage that are highly reliable and tailored for liquid cooling systems.

Centralised PCS

1500 V step-up and converter all-in-one machine. Low construction, installation and maintenance costs. Economical and efficient and suitable for centralised large scale grid side energy storage.

Long Duration Energy Storage Solutions

Moving beyond 2 hour systems

As BESS markets expand globally Envision are adapting to increasing demands for technology to move beyond 2-hour duration systems. Envision is designing and developing products to provide 4-hour, 6 hour and 8-hour solutions.

String PCS

String PCS and DC/DC design enables efficient operations and maintenance, maximising usable capacity by reducing current recirculation and DC cable loss, while improving electrical safety by provide string-level isolation.

Smart Energy Storage System

AC Products

Reliable liquid cooling design

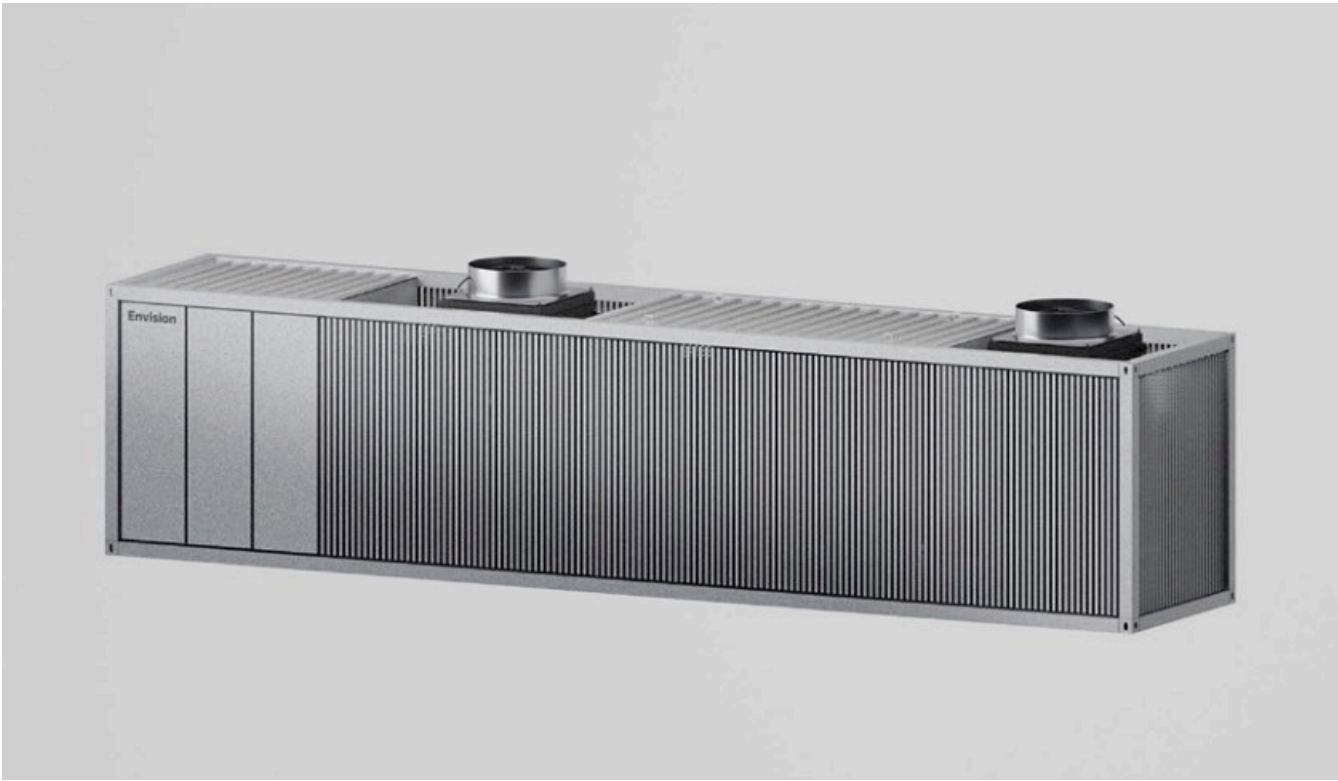
- Liquid cooling design, IP65 protection ensuring long-term reliable operations
- Higher power density, less footprint

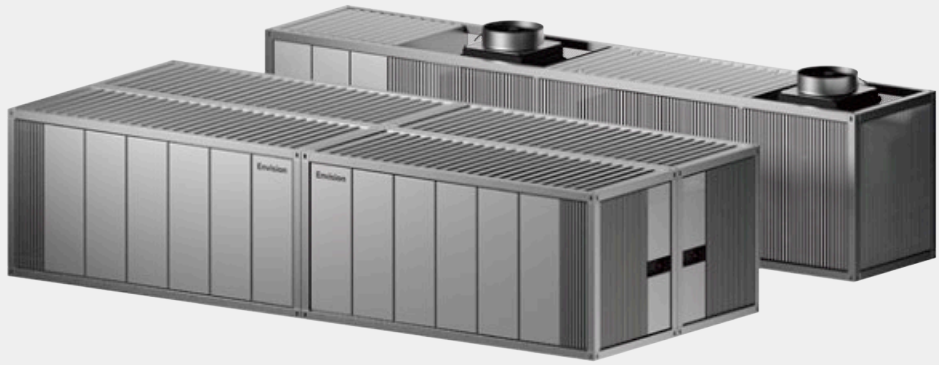
Efficient three-level design

- Maximum efficiency ≥ 99%, better power quality

Excellent performance in power grid

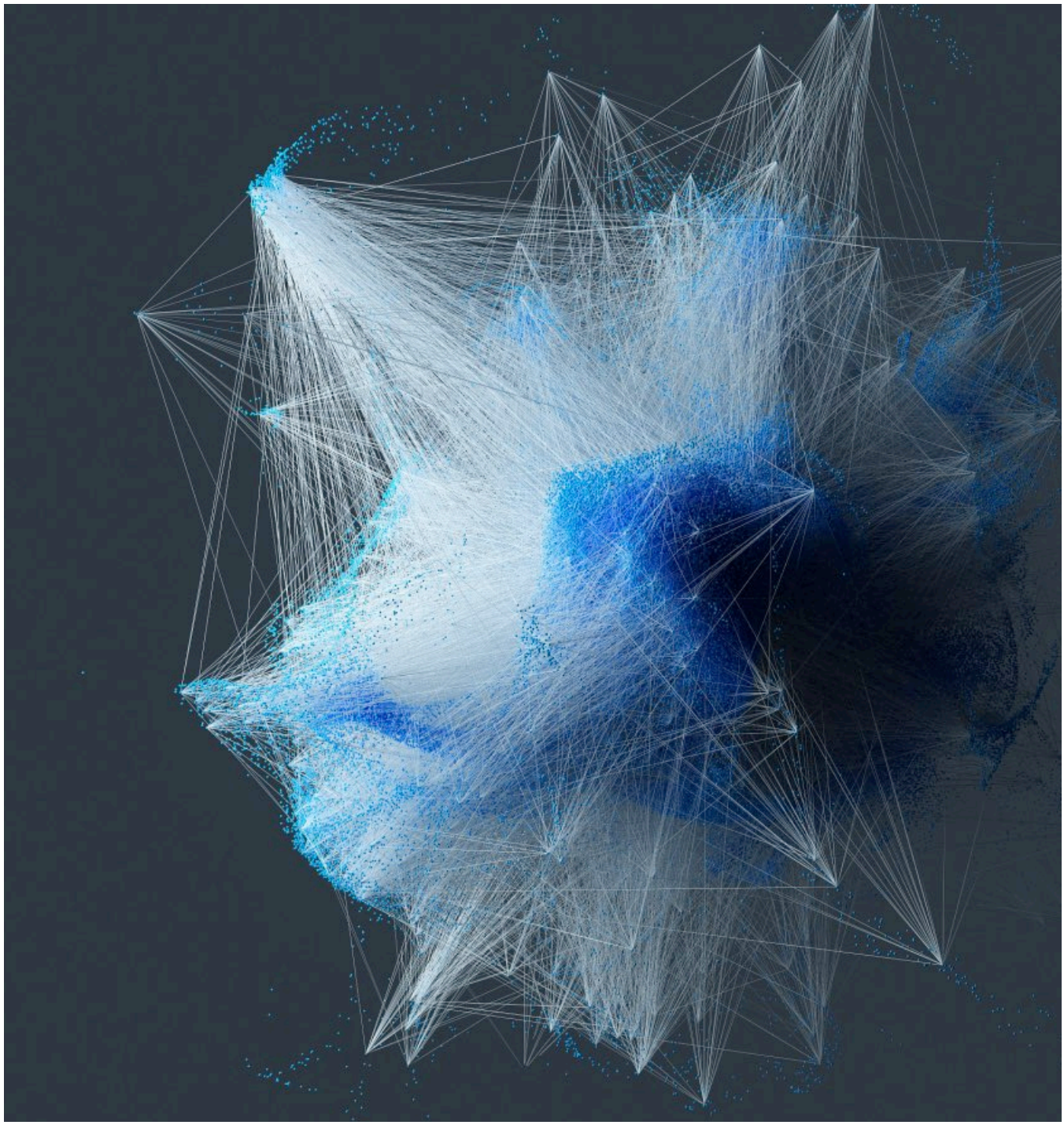
- With four-quadrant PQ adjustment capability Support continuous HVRT & LVRT
- Active/reactive rapid response capability (5ms)
- Support grid-forming operation mode





Model	SingleSkid-3300	TwinSkid-5000	TwinSkid-5500	TwinSkid-6900
PCS Rated Power, kW	3450	2500x2	2750 x 2	3450 x 2
Max. AC power, kW	3795	2750x2	3025 x 2	3795 x 2
Rated grid frequency, Hz	50/60	50/60	50/60	50/60
Power factor	0.95	0.95	0.95	0.95
Adjustable range of PF	-1 to +1	-1 to +1	-1 to +1	-1 to +1
Transformer capacity, kVA	3300	5000	5500	6900
Rated grid voltage, kV	33	33	22 / 33	22 / 33
Operating temp. range, ° C	-40 to 45°C	-40 to 45°C	-40 to 45°C	-40 to 45°C
Dimensions (l, h, w in mm)	5400 x 3000 x 3200	12192 x 2591 x 2438	12192 x 2438 x 2591	12192 x2438 x 2591
Weight (t)	＜16	＜32	＜32	＜32
Communication protocol	Modbus-RTU / Modbus-TCP IEC61850 / IEC104			
Certification	GB/T34120 / IEC62477-1 IEC61000-6-2 / IEC61000-6-4			

Energy Storage Software Product Series



Cloud

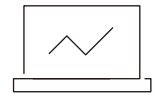
On-Premise / Plant

Unit

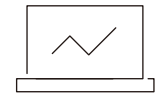
EnOS™ Energy Storage Centralized Control

- One stop monitoring centre
- Comprehensive performance system
- Flexible and configurable applications
- Suitable for multi scenario devices

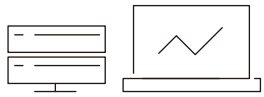
Storage M&C Product



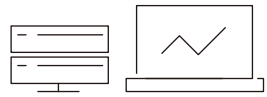
Storage Advanced Analytics

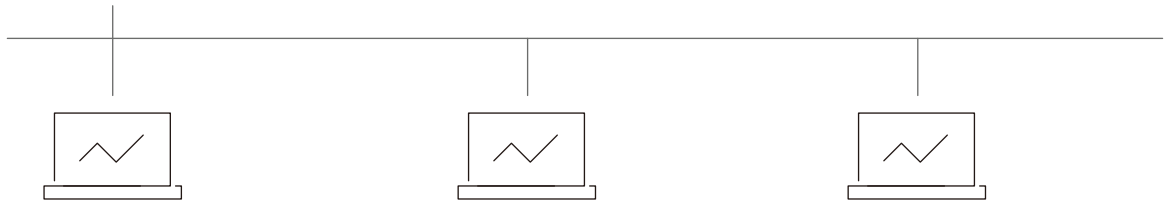


Hybrid PPC



Hybrid SCADA

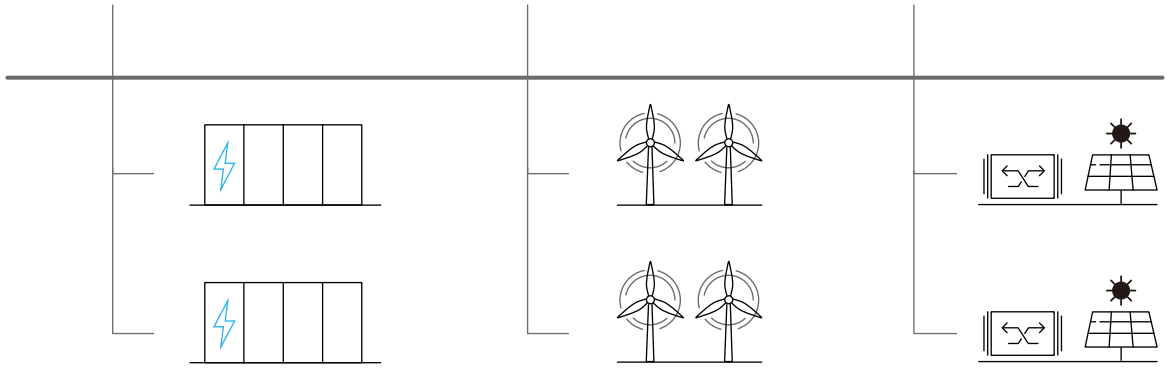




EnOS™ ESS EMS / PPC

EnOS™ Wind Farm EMS / PPC

EnOS™ PV EMS / PPC



Standard Applications

EnOS™ SCADA

Supports real-time data monitoring and intelligent alarms with reporting, trending, and analysis capabilities. The software integrates with BoP SCADA, stores 2 years of data locally by default and has full user permissions/auditing and workflow capabilities for local teams. Complex electrical topology and subsystem views of data are also available.

- **Panoramic monitoring**
- **Data analysis**
- **Real time alarm**
- **Comprehensive report**

EnOS™ EMS

Fast energy management system (EMS) with real-time closed loop control for grids integrated power plant controller (PPC) supporting co-location of assets if required and enabling forecast scheduling, ancillary services, frequency control and it is the key point of integration for commands from an RTM provider directly to the PCS at site.

- **Active power control**
- **Primary frequency modulation**
- **Reactive power control**
- **Inertia response**

EnOS™ Cloud

EnOS™ cloud platform enabling the CBBs and SaaS applications with off-the-shelf capabilities in data acquisition, data processing and data enrichment through AI/ML. Hosted on Microsoft Azure in Europe, the EnOS™ cloud platform cost is included in the SaaS apps for M&Cs application and the additional fees for advanced modules.

- **Primary frequency modulation & inertia response**
- **Power prediction collaboration**
- **Anti-over demand and anti-reverse current flow control**
- **Electricity sales collaboration**

Cases of Envision Smart ESS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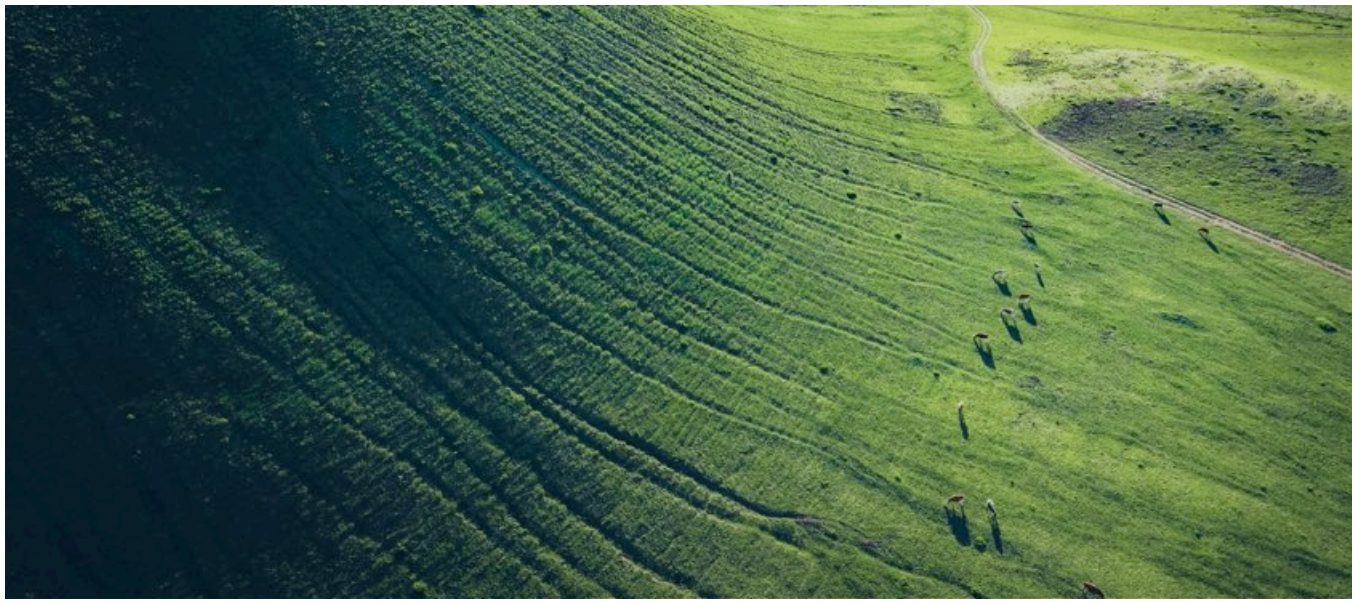
Envision

Power, Grid, Load and ESS

New Generation Grid Friendly Green Power Station Demonstration Project



China's first large-scale "source, Grid, Load, and Storage Integration" project

System capacity: 70 MW/140 MWh

Supports stable power consumption by the Ulan Chab all-green energy park. It can provide 80 ms power response to the grid to improve system power supply capabilities during peak hours thus ensuring the safety of energy consumption at the user side and boosts the use of renewable energy locally.

Source, Grid, Load and Storage

Envision Ordos Net Zero Industrial Park Demonstration Project

Global Pioneered 100 billion RMB Net Zero Industrial Park

System capacity: 10 MW/20 MWh

The synergy among energy storage, smart wind power and PV provides a steady stream of green power for the park, and it uses 100 % green energy. Utilising the EnOSTM, with its AI and IoT operating system, the production and consumption of green energy are connected to create a safe and stable new power system.

Under the unified scheduling of EnOSTM, Envision's AIoT operating system, the production and consumption of green energy are connected together to create a safe and stable new power system.

Grid Side Energy Storage

Renewable Energy + Energy Storage Complementary Win-Win Demonstration

"Renewable Energy + Energy Storage" complementary and win-win demonstration

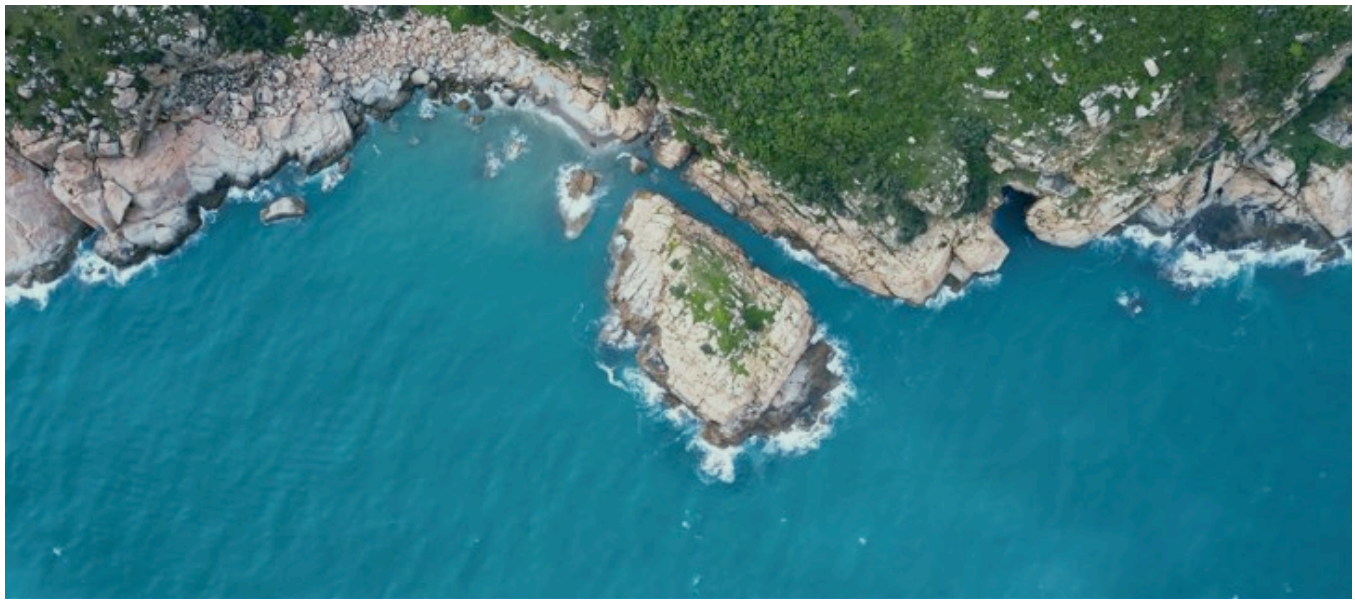
System capacity: 101 MW/204 MWh

The EnOSTM AI and IoT operating system integrates functions such as energy management data collection and status monitoring of energy storage stations with advance analytics and safety and risk prognostics to achieve real-time responses such as, peak shaving, frequency regulation and voltage control. The fastest closed-loop control task is 100 ms, for 100 MW units.

Leasing energy storage capacity to renewable energy enterprises such as wind power and PV can reduce the investment and operational costs, creating a win-win for both client and the environment.

Grid Side Independent Energy Storage

Jurong Island, Singapore



Singapore's first 100MW independent energy storage project

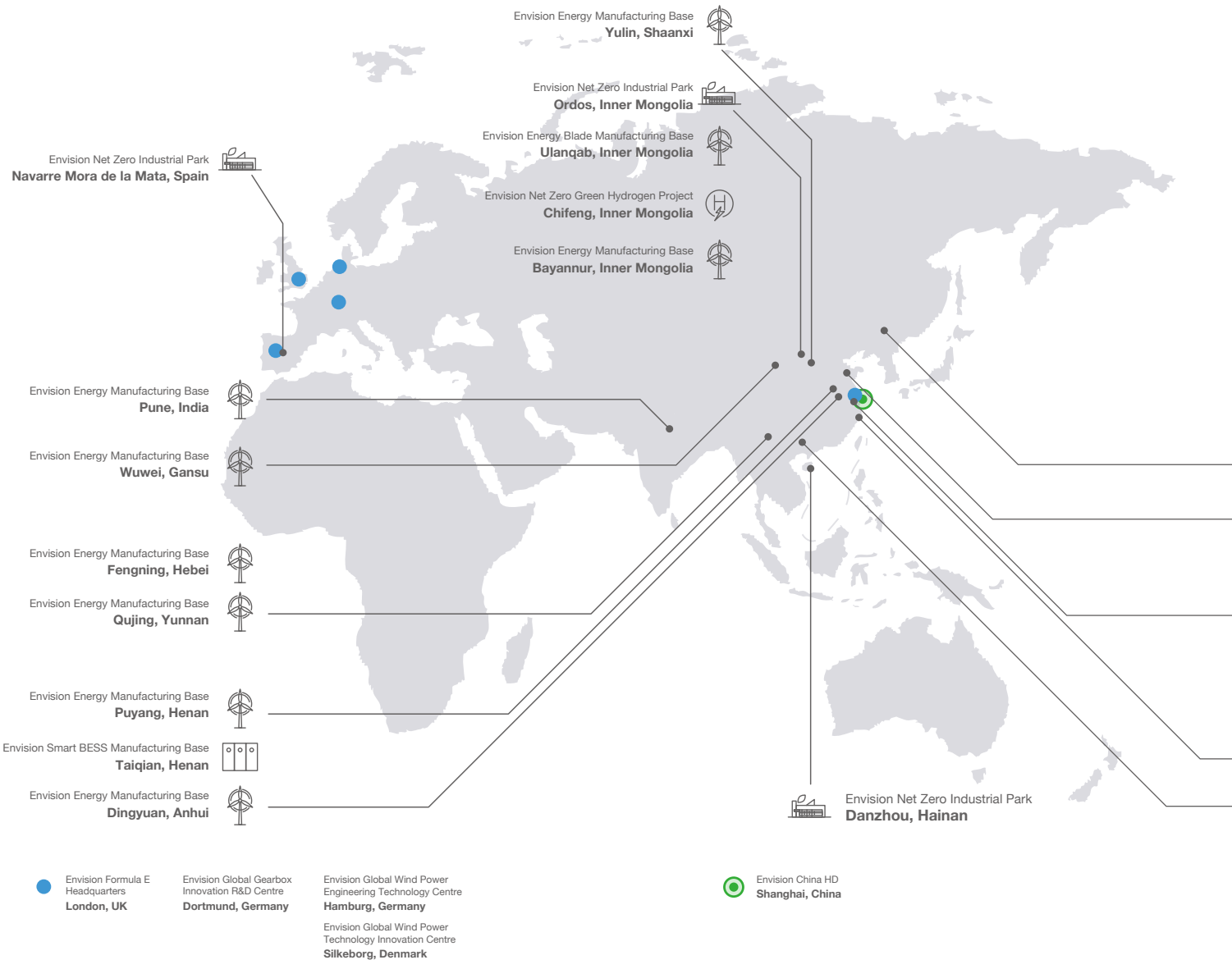
System capacity: 100 MW/100 MWh

Supports Singapore to accelerate the implementation of clean energy alternatives, reducing carbon emissions and help achieve the vision set in the ‘Singapore Green Plan 2030’. Its system architecture meets the requirements for the most stringent EI120 fire protection and heat insulation requirements. It offers dynamic battery replacement for 10 years of operation and provides the client with the safe and effective liquid cooled BESS throughout the project’s life cycle.

About Envision

Envision Energy is a world-leading green technology company, providing renewable energy system solutions for global enterprises, governments and institutions. With "solving the challenges for a sustainable future", as its mission, Envision Energy continues to make renewable energy production and storage synergies less costly through technological innovation.

Encompassing three major business sectors, Smart Wind Turbines, Smart Energy Storage, and Green Hydrogen Solutions, Envision Energy collaboratively constructs comprehensive solutions for the net zero energy transition.



Envision Energy is consistently awarded and ranked as one of the world's most innovative and leading companies. TIME ranked Envision Energy as 'TIME100 MOST INFLUENTIAL COMPANIES 2024' and BloombergNEF ranked Envision Energy in 2024 as a Tier 1 global energy storage manufacturer and Fortune's 2021 'Change the World' list Envision ranked 2nd. Today, Envision Energy leverages its global network of R&D and engineering centres across the U.K., France, Germany, Denmark, China and the United States to continuously lead global green technology development.

Envision Energy joined the Science Based Targets initiative (SBTi) in 2021 and is committed to achieving the 'Business Ambition for 1.5°C'. It achieved carbon neutrality across its global operations in 2022 and will achieve carbon neutrality throughout its value chain by 2028.

Envision has gold status with EcoVardis and is in the 97th percentile, leading internationally with our environmental approach.

To find out more please visit and follow us on:
Web: envision-group.com
LinkedIn:https://www.linkedin.com/company/envision-energy

Envision Energy Manufacturing Base
Tongyu, Jilin

Envision Energy Manufacturing Base
Rushan, Shandong

Envision Energy Manufacturing Base
Haiyang, Shandong

Envision Carbon Neutrality Technology Industrial Park with 100 Billion Scale
Wuxi, Jiangsu

Envision Energy Manufacturing Base
Sheyang, Jiangsu

Envision Energy Manufacturing Base
Cangnan, Zhejiang

Envision Energy Manufacturing Base
Qinzhou,Guangxi

Envision Carbon Neutrality Fund
Wuxi, China

Envision Smart Energy Software R&D Center
Nanjing, China

Envision Aerodynamics and Meteorology R&D Center
Colorado, USA

Envision Energy Green Hydrogen R&D Center
Boston, USA

Envision Photovoltaic Innovation Center
Silicon Valley, USA

SMART BESS PRODUCT BROCHURE

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