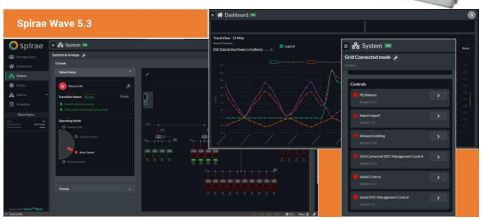
BATTERY ENERGY STORAGE SYSTEM

Fully Integrated Microgrid Solution



PRODUCT FEATURES

Turnkey Solution for Fast Install Fully integrated, pre-configured package system reduces on-site installation time; includes PCS(s), DC/DC Converters, ATS, battery system, BMS, HV box, Microgrid Controller, HVAC, fire suppression, DC Bus, switch, and outdoor rated enclosure.

Built-in Microgrid Controls Integrates seamlessly with solar, genset, wind, micro-turbines, utility, or other distributed energy resources.

WAVE EMS / Energy management software designed monitor and operate your system from any browser with proper authentication. Gain insight into the performance of deployed systems with a robust monitoring system that gathers metrics, visualizes data, and alerts operators when things need attention.

On-going Operation & Maintenance available through our operation team will help reduce electricity costs, enhance resiliency, and maximize ROI. Supports remote operation and maintenance for multiple sites.

Safe Technology & Multi-level Protection Utilizes Tier 1 Lithium Iron Phosphate (LFP) chemistry for superior safety, thermal stability, and reliability. Features an integrated multi-level Battery Management System (BMS) that monitors, optimizes, and balances the system.

Easy & Flexible Scalability This modular, outdoor-rated solution can be scaled according to energy and power requirements, operating at either 208Vac or 480Vac with up to three (3) units in parallel.

Excellent Local Support Our USA & Canada operation and technical support team is available to assist from project design to completion.

MICROGRID CONTROL SYSTEM – WAVE EMS

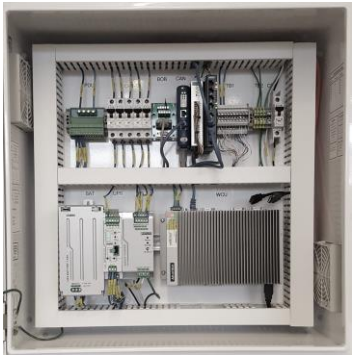
Wave gives project developers, aggregators, IPPs and utilities the ability to reliably operate microgrids with portfolios of renewable and distributed energy resources (DER). These microgrids enable new business models based on energy arbitrage, fuel offset, Virtual Power Plant (VPP) operations, market participation, energy independence, and system resiliency.

Wave Microgrid comes with standard capabilities such as Asset Monitoring and Control, Scheduling and Dispatch, Active and Reactive Power Import and Export Control, Islanding and Resynchronization, Frequency Control, Voltage Control, and Spinning Reserves Management. With its standard Application Programming Interface (API), Wave can also be quickly extended to implement custom economic and optimization logic to meet different customer and market requirements.

Wave is an innovative control platform that combines advanced power control algorithms with a flexible, scalable, and adaptable software architecture for managing dynamic portfolios of DERs. Wave also enables users to implement customizable business logic to tap a variety of value streams.

Electrical	
Input voltage:	100 V AC...240 V AC
Input current:	Minimum 10 A
UPS backup time:	Approx. 15 minutes
Communications	
Standard Protocols:	ModBus TCP, DNP3, IEC-61850
Environmental	
Ambient temperature (control unit, power supply, I/O, ethernet switch):	-10°C to 60°C
Ambient temperature (UPS battery):	0°C to 40°C
Relative humidity:	5% to 80% at 25°C (non-condensing)
Mechanical	
Typical enclosure size:	24" x 24" x 10"
Ventilation clearance:	Min. 6" left and right sides
Approximate Weight:	38.5 kg (85 lbs)
Enclosure ratings:	IP52, NEMA 12
Control Unit Hardware	
Model:	Advantech UNO-238
Processor:	Intel® Core™ i5 8365UE
Memory:	16GB RAM, 512GB SSD
OS:	Debian 10
User Interface	
Users access the Wave Commander with Wave Client software installed on remote workstations or laptops. A local touch screen interface is optionally available.	

BENEFITS



Optimization
Wave allows users to dynamically set asset constraints, system constraints and system objectives and capabilities and convert them into desired outcomes.

New Business Models
Wave can be customized with proprietary business intelligence via its adaptable Application Programming Interface.

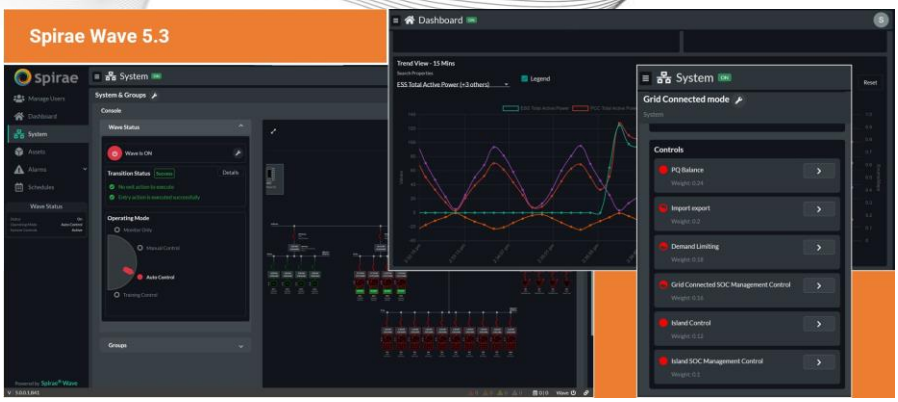
Flexible and Scalable
Wave interoperates with existing SCADA and DMS systems and can be configured to systems of any size. Its flexible and scalable architecture allows assets to be added, removed or changed without extensive development costs.

Reduced Costs
Wave gives developers a powerful tool to reduce design and operational costs by optimizing system sizing to yield the greatest ROI.

Rapid Installation
Wave streamlines design and configuration of assets with automatic code generation and software deployment, standardized field engineering and provides end-to-end system commissioning.

Interoperable
Wave uses open communications with standard protocols, Active Directory based access control, and ensures interoperability with portfolios of DER.

MICROGRID USE CASES



Microgrids are applicable where distributed energy resources such as generation, storage and demand assets must operate as an integrated system to meet facility operating objectives such as minimizing cost of energy, net-zero operations, higher resilience, greater renewables, EV integration, and market participation.

Capabilities

Base Capabilities

- Monitoring and Control
- Scheduling and Dispatch
- Active Power Import and Export Control
- Reactive Power Import and Export
- Islanding and Resynchronization
- Frequency Control
- Voltage Control
- Spinning Reserves Management
- Load Forecasting
- Renewables and Variability Forecasting
- Reporting

Optional capabilities

- Market Interface (VPP)
- Custom Apps

Energy Service Providers and Project Developers need a configurable, scalable, and supportable foundation to deliver DER-based energy services to end-use customers and energy market participants. Microgrids developed using Wave platform serves as a “template-driven” solution that is easy to configure, test and validate, commission, and support. Wave microgrids can also be sync’d to cloud for remote access, long term data management, and access to cloud services.

OPERATION SCENARIOS

Energy Cost
Operating Mode: Grid-connected
Objective Commercial facility desires to minimize energy costs, carbon footprint and energy price volatility without incurring significant up front capital costs.
Our Solution Monitoring & Control of DER and loads, Import/Export Control of Real and Reactive Power, Renewable Power Production, Storage Management are all used to enable optimal dispatch of DER to minimize facility energy costs and carbon footprint.
Benefits Energy cost reduction through tariff optimization and fuel price certainty through onsite solar and dynamic energy management.

Resiliency
Operating Mode Normally grid-connected but capable of grid-independent operation during emergencies or grid failure.
Objective University campus in hurricane prone area wants to ensure that it can continue critical operations and serve as safe zone during grid failures during emergencies. University wants the capability to operate major functions for a minimum of seven days and critical functions indefinitely off grid using existing and new assets and to prioritize loads. University prefers 3rd party owner/ operator to manage infrastructure.
Our Solution Ability to network all campus gensets, renewables and storage systems, implement automatic demand response, ability to align campus load with wholesale power purchase schedule, remote system operations and optimization in normal conditions, local control in emergency conditions.
Benefits Remotely manage energy infrastructure, achieve predictable costs, hedge against market price volatility with PV and local resources, ensure high power quality, and low carbon footprint.

Fuel Offset and Carbon Reduction
Operating Mode: Grid- independent
Objective Island resort desires reliable energy infrastructure that operates independent of weak local grid to offset diesel, maximize renewable energy, increase power quality, and control energy costs.
Our Solution Analytics are used to select system assets that minimize capital expenditures and operating costs. Out of the box capability to run the resort 24x7 in island mode with established power quality parameters; redundancy to support emergency operations.
Benefits Energy independence and control over critical infrastructure for resort operations. Predictable costs, minimum exposure to fuel cost volatility, high power quality, and low carbon footprint.

Utility Operated Community Microgrid
Operating Mode Grid connected and grid independent
Objective Progressive distribution utility desires to install and operate microgrids in targeted locations within their service territory to defer grid upgrades, provide greater reliability to remote areas and integrate higher amounts of renewables closer to loads.
Our Solution Utility owned microgrids integrate seamlessly with grid operations applications such as SCADA and DMS. Distributed resources may include a mix of utility owned assets and customer owned assets that are recruited through programs offered by the utility. Well-defined operating modes are available to grid operators such as volt/VAR optimization, renewables balancing, and island operations.
Benefits Utility can support load growth in targeted areas without immediate network upgrades. Resiliency of communities served by failure- prone transmission or distribution is enhanced. Remote communities can be served with high penetration renewables without costly system upgrades. Enhancements achieved with minimal impact on existing grid operations systems.

[S90] TECHNICAL SPECIFICATIONS

**1.Only 30KW system configuration has 208 Vac output available. 2.Each MPPT has 2 string inputs. 3.480Vac with a maximum of 3 units in parallel.

Battery System

Battery Type:	Lithium Iron Phosphate [LFP]
Cell / Module Energy:	Pouch Cell100Ah / 10.24kWh Module (2P16S)
Nominal Energy:	133/266KWh
Usable Energy:	120/240kWh
Nominal Voltage:	665.6V
Operation Voltage Range:	582.4V~748.8V
Cycle Life Temperature (25℃±2℃) :	8,000or15,000cyles@60%SOH
Max Charge/Discharge Rate:	0.5/0.5CP

Electrical System

AC Input Voltage [Built-in Transfer]:	480VAC 3 Phase
Grid Frequency:	50/60 Hz
Rated Output Apparent Power:	33/66/99kVA *n(1-3)
Rated Output Real Power:	30/60/90kW *n(1-3)
Rated Output Current:	90/180/270A*n(1-3)
AC Voltage Grid-tied:	480V(-15%~15%) 3P3W+PE
AC Voltage Off-grid:	480V(-5%~5%) 3P3W+PE
Charging & Discharging Voltage:	150V-750V (350V-750V@full load)
DC/DC Converters Power:	45/90/135kW*n(1-3)
Max Input Current :	65/130/195A*n(1~3)
PV Input Voltage Range:	200V-830V
THDi:	<3%

Environmental

Operating Temp:	-22 to + 131 ° F / -30 to +55°C
Operating Humidity:	0-90% (No condensing)
Cooling:	Forced Air Cooled/HVAC System
Enclosure:	NEMA 3R/IP54
Max Elevation:	Up to 3000 Meters with Derating
Dimension:	W2100mm*H2450mm*D1300m
Weight:	4000kg / 8820lbs
Noise Level:	70dB

Certificates

Inverter/PCS/DC Converter(s)	UL1741, UL1741SB, UL1699B IEEE1547, HECO SRD, EN50549, AS4777.2, VDE4105, G99, IEC 62109, FCC Part 15, CE/EMC
Batteries	UL9540A, UN3480 UL1973/IEC62619/EMC/FCC
System	UL9540

Hardware Protections

AC Breaker with Shunt Trip	Fire Suppression System
Aux Power	DC Pre-charge &DC Disconnect
Auto Transfer Switch	Gas Detector & Sensor

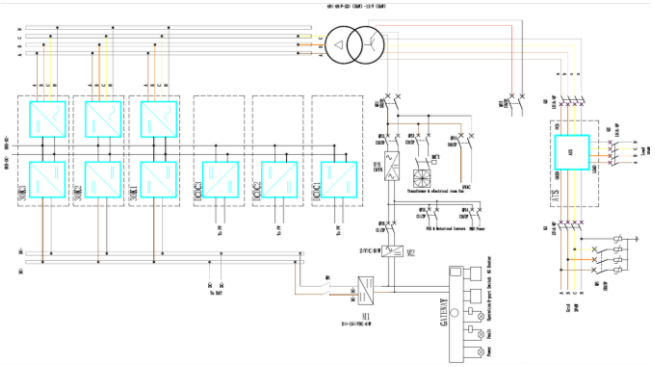
Communication Interfaces & Software [EMS]

- Communication Port: CAN/RS485/Ethernet
- Communication Protocol: Modbus TCP/RTU, IEC104
- Operation & Control Setting, Scheduling, Status & Load Monitoring
- Cybersecurity
- Profit Analysis / Economic Analysis
- Equipment Monitoring and protective power curtailment

Key Technologies

- Microgrid Control / Virtual Power Plant [VPP]
- Demand Management & Peak Shaving
- Increased PV Solar Self-Consumption & Optimization [Solar + Storage]
- Off-grid or Grid-tied Applications [Net Zero Building Technology]
- Back-up Power & Capacity Reserve Resiliency

Electrical Schematic Diagram



Applications

EV Charing Station

Rural Community

Logistic & Warehouse

Hotel & Resorts

EV Car Dealer

Industrial Manufacture

Multi Family Homes

Commercial Building

School & Hospital

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Do you need a help with install? No worries.

Are you an EPC or commercial solar and battery installer? Eqube Power also offers ongoing engineering support services and operation support. Give us a call or email today to see how you can future-proof your business with an Eqube Power System.