Spirae

wave™

Microgrid

Introducing Wave™ Microgrid

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

Spirae 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.

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

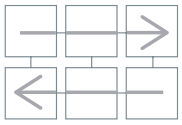
Market Interface (VPP)

Custom Apps

Benefits

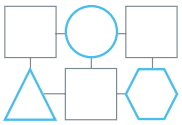
Reduced Costs

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.

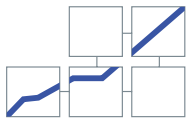


Flexible and Scalable

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.

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.

Interoperable

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

Microgrid Use Scenarios

Microgrids are applicable in situations where a collection of energy resources such as generation, storage and demand assets within a defined boundary may be operated as a cohesive system to cost effectively meet facility or corporate energy goals.

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.

Spirae 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.

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.

Spirae 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.

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.

Spirae 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.

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.

Spirae 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.

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