

smarter grid solutions

A Mitsubishi Electric company



Cirrus FLEX

AGGREGATED CONTROL OF ENERGY ASSET
FLEETS TO OPTIMIZE PARTICIPATION IN
MARKETS AND GRIDS.

The logo for Cirrus FLEX. 'Cirrus' is written in a green, rounded font with a green line graph above it showing an upward trend. 'FLEX' is written in a bold, black, sans-serif font.

Cirrus FLEX

Product Overview

Cirrus Flex remotely optimizes and dispatches Distributed Energy Resources (DER) using advanced analytics, linking diverse DER assets and fleets between owners, operators, aggregators, and traders to maximize the returns from energy, grid services and flexibility markets. This cloud hosted Virtual Power Plant (VPP) platform enables asset owners and operators to unlock the stacked benefits of DER and manages market, flexibility and aggregated services, addressing the new opportunities from FERC Order 2222 in the US and similar market transitions internationally.

DER owners and operators including energy asset OEMs, finance houses, Commercial and Industrial (C&I) customers, local authorities, and community energy organizations need to monitor, aggregate, and control their growing DER portfolios to deliver behind-the-meter benefits, participate directly in energy markets, as well as interface to trading partners and new flexibility markets.

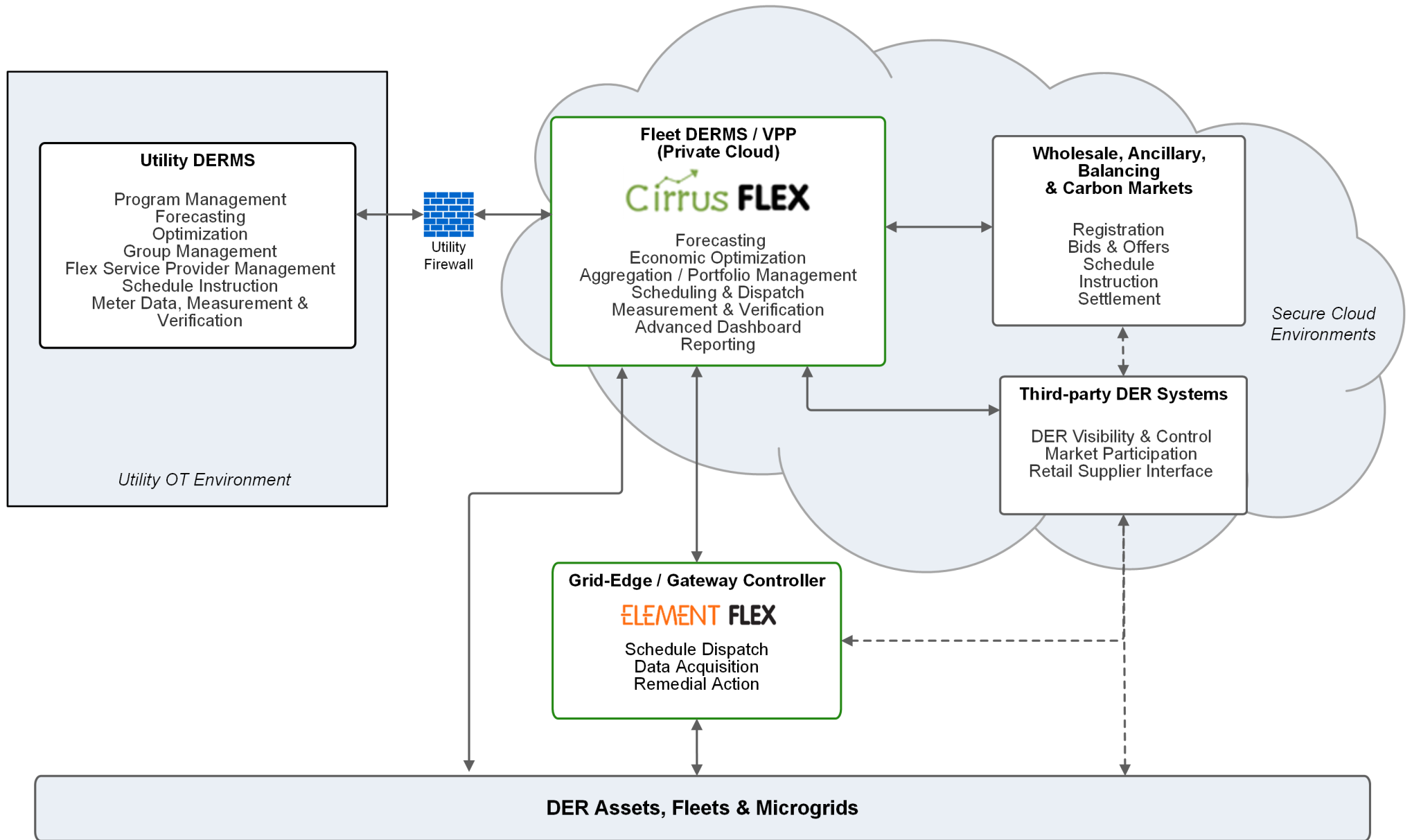
Energy service companies require those same grid and market interfaces plus enhanced user and customer features for owned and third party DER assets. Cirrus Flex integrates with a diverse range of the Internet of Things (IoT) enabled DERs through modern cybersecure interfaces.

What makes Cirrus Flex unique?

- Enabling the management and control of DER to participate in energy markets
- Optimization of individual and aggregated DER ruggedized for operations based on diverse real-world experience
- Predictive Analytics that provide users with the flexibility to build the best solutions to meet business requirements without being restricted to 'out of the box' algorithms
- Open Data Access – Cirrus Flex stores all the data you need to generate settlement, baseline, and performance reporting for your assets using simple APIs to access data stores, and leverage powerful BI tools
- Multiple DER integration options to support communications direct to energy assets, front-of and behind-the-meter, individual devices, hybrid sites and aggregations through direct dispatch or schedules, via open standards and secure public internet

We have more than a decade of experience working with utilities, delivering a wide range of energy asset use cases, device controls/protocols, and integration with utility ADMS and SCADA systems – all creating a robust, flexible and scalable platform to manage your assets and monetize their operations.

Reference Architecture





Hosting Environment and Security

Cirrus Flex is hosted on ruggedized external cloud-hosted environments or within virtual private clouds and exploits inherent cloud capabilities to provide enhanced levels of resiliency and ensures it can scale both vertically and horizontally to meet current and anticipated needs.

Our product has been independently penetration tested to ensure compliance with industry standards, and are based on established and accepted security architecture best practices, including but not restricted to the following:

- Multiple geographical deployments to ensure high availability of services and disaster recovery
- Security groups and network access control lists to protect information and assets
- Identity and access management policies to control access to resources using a Grant Least Privilege policy
- Monitoring, logging and alerting services to enable auditing of asset security
- Network subnets for unique routing requirements, separating the security concerns by using public subnets for external-facing resources and private subnets for internal resources
- Multi-factor authentication support
- Support for flexible password policies and session control, including timeout and lockout
- Support for fine-grain role-based access control to allow flexible access to assets and control capabilities
- Secure HTTPS access to web services using TLS 1.2 encryption
- Comprehensive security auditing of user activity at both operating system and application layers
- Server firewalls enabled with deny-all default policies
- Application servers built using best practice hardening policies
- Security patching, malware and backup policies tailored to customer requirements

Key Features and Use Cases

DER registration and management

DER and market operational forecasting

Aggregated DER portfolio optimization (revenues, costs) to customer objectives

Energy asset management and monitoring

Automated portfolio dispatch and redispatch

Measurement and verification of asset performance

DER service delivery event settlement

Owned and third-party asset integration

Direct and aggregator integration

Front-of-the-meter (FTM) and Behind-the-meter (BTM) DER integration

Trading tool integration

Coordinated local, regional and national market interfaces and user interactions

Utility systems integration

Operator interface

End customer portal / app integration

Management reporting (e.g. CO2)

Device Management

Cirrus Flex uses industry standard protocols to provide reliable connections to owned and third-party assets, either via direct links or aggregators. These include, but are not limited to ICCC, DNP3, Modbus, REST, OpenADR, SunSpec.

Cirrus Flex has a technology agnostic approach to integration with the ability to integrate directly or via aggregators for all types of DER: smart thermostats, residential, or, commercial & industrial (C&I) water heaters, distributed generation (PV, wind, thermal), water pumps, AC cycling switches, storage, and utility owned/third party owned Energy Storage Systems.



Our product enables individual device control utilizing SGS's grid edge product, Element Flex, or integration with existing device control systems.

Use Cirrus Flex to meet FERC 2222 operating guidelines and manage groups of assets - DER are able to be grouped dynamically by the user (e.g., by DER type, zone substation, or ISO node).

Asset Monitoring, Control and Reporting

The Cirrus Flex User Interface is highly configurable and puts power in the hands of the operator to monitor and control DER, using fully customizable and shareable dashboards built on a set of re-usable widgets.

Devices are controllable using set-point or scheduled dispatch to enable a diverse set of DER operation and market participation models. Users can group DER to make a single controllable entity and utilize the same monitoring and control capabilities as they would with individual DER assets to manage any number of devices.

Cirrus Flex displays real-time measurements through the user interface, while also providing real-time monitoring of individual DERs. In addition, Cirrus Flex contains an operational data store which records all system actions, calculations, and DER feedback data for reporting purposes and post-event analytics to fuel analysis and refinement.

Operational Forecasting

Cirrus Flex integrates with external weather forecasting API's and real-time grid telemetry to provide ruggedized operational load and generation forecasting that can subsequently power advanced DER optimization and other predictive analytics. A fully configurable DER schedule and dispatch engine supports diverse DER participation models that can be configured depending on the operational objectives to provide DER forecasting, optimization, and control, either in isolation or altogether.

Advanced DER Optimization

Cirrus Flex brings together best-in-breed technologies and techniques that interface with device, grid and market data to maximize the utilization of diverse DER to unlock multiple, stacked revenue streams. Cirrus Flex hosts a configurable optimization application,

to enable customers to specify objective functions that fit their specific operational strategies and optimize energy, carbon, costs and revenues.

Our optimization approach is highly flexible and leverages the power of AMPL (third-party optimization software) to solve complex problems. Any monitored or calculated data point is available to the optimization, and objectives and constraints are customizable based on customer needs and the use case. Our diverse real-world experience in operationalizing advanced analytics ensures that the DER optimization strategy deployed is suitable for reliable operations.

Market and Grid Integration

Enabling customers to stack revenues, maximizing the value of energy assets through flexibility market, energy market, grid services and behind-the-meter revenue and value streams. Cirrus Flex provides the ability for customers to opt-in / opt-out from any event via the user interface or over the aggregator API, and provides the tools needed to assist our customers in achieving FERC Order 2222 objectives.

Use the Cirrus Flex optimization application to optimize asset schedules based on market price or asset forecasts, or to inform the optimal bid/offer combination for different assets and aggregations. Objective functions are developed in collaboration with customers to reflect the business strategy and available operational data and forecasts.

Advanced Virtual Power Plant Operation

Using its unique DER device management and real time application hosting capabilities, Cirrus Flex can be easily configured to provide VPP operation for a wide range of aggregated DER assets and in technical and commercial VPPs of different scales. These flexibly and dynamically grouped DERs within VPPs can be scheduled and controlled to deliver value adding services for the DER owner, grid and market.

Energy as a Service Business Models

Our solutions enable customers to develop new business models by combining and optimizing mixed portfolios of DER assets for grid and market applications. Our customers can incorporate and realize investment finance and build in operational objectives as configurable rules to secure those business models.

Reference Projects



Energy as a Service Platform

Status: Operational

SSE Energy Services needed to optimize a portfolio of DER assets including gas peaking plants and large battery storage systems, for a broad range of value streams. The deployed Cirrus Flex solution integrates with SSE Energy Services asset management and trading platforms allowing SSE Energy Services to trade assets in GB capacity and balancing markets, and calculate settlement for all managed assets, whether owned by SSE Energy Services or third parties. SSE Energy Services are using the platform to deliver Energy as a Service to current and future customers, allowing them to increase return on investment on their DER assets.



Battery Revenue Stacking

Status: Operational

Con Edison and Endurant wanted a solution to aggregate utility scale batteries to dispatch peak load relief services, and then allow Endurant to trade residual battery capability in the NYISO markets. The deployed solution consists of a cloud-hosted instance of Cirrus Flex that integrates directly with both ConEd and NYISO to enable both utility grid services and market revenues. Revenue stacking grid load relief services and NYISO market services has enhanced the return on investment.



Community Energy Virtual Power Plant

Status: Operational

Low Carbon Hub is leading an ambitious, wide-ranging and innovative trial, seeking to accelerate the UK's transition to a zero-carbon energy system. The solution uses Cirrus Flex as a cloud hosted platform to deliver new market and flexibility models, advance the capabilities of distribution networks to manage smart, renewable and storage technologies (including building management systems, battery storage and solar power) and facilitate local community group participation in energy markets.



Smart Energy Management Platform for Net-Zero Carbon

Status: Operational

West Berkshire and Reading Borough Councils are installing new electric vehicle charging infrastructure in combination with renewables and building energy management systems. The primary objective is meeting municipal carbon reduction targets through improved asset operational status monitoring and integrating energy, carbon and market data flows to Cirrus Flex. That data is then used by Cirrus Flex to check the performance and optimize the operating schedules of the new, clean, on-site energy assets.



About Smarter Grid Solutions

Smarter Grid Solutions (SGS) is a leading enterprise energy management software company specializing in distributed energy resource (DER) management systems (DERMS) and operating internationally from bases in the UK and US.

SGS manages significant groups of renewable generation, energy storage and flexible loads for customers in North America, Europe, and Asia. Its solutions have already saved customers more than \$400 million in avoided grid upgrades.

SGS DERMS products are used by distribution utilities, energy services companies, microgrid operators, energy asset developers and owner-operators, aggregators, and traders to:

- Connect, monitor, control and optimize DER assets and fleets of any type, size and location using secure and standard integration methods.
- Manage and coordinate DER participation in the grid and market in line with FERC Order 2222
- Optimize Virtual Power Plant operating schedules to maximize returns from energy markets and flexibility
- Manage grid capacity and headroom to speed up interconnections and save on grid upgrade investments
- Integrate microgrids and deliver grid-connected, island and black-start functions
- Connect microgrid assets to markets to optimize revenues while delivering supply security
- Track and optimize carbon for 24/7 Carbon Free Energy
- Underpin new business models including 'as-a-service' to deliver customer and partner objectives
- Provide high resolution and high-fidelity data for advanced analytics functions



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