smarter grid solutions

STRATA GRID

NEXT-GENERATION UTILITY DERMS COMBINING GRID AND MARKET MANAGEMENT WITH REAL-TIME CONTROL

A Group Company of

MITSUBISHI ELECTRIC

PRODUCT OVERVIEW

Strata Grid is our highly flexible and scalable DERMS software platform designed to operate within the utility Operational Technology (OT) environment. It provides failsafe, autonomous management and control of a broad spectrum of Distributed Energy Resources (DER) and is enabling utilities to transition to a modern Distribution System Operator (DSO) / Distribution Service Provider (DSP) capable of accelerating the path to net zero carbon.

Our unique, patented, and field-proven approach to DERMS leverages our suite of advanced control technologies to continuously deliver deterministic sub-second DER control, pragmatically addressing the model and data challenges of using advanced grid analytics in an operational environment.

Strata Grid supports preventative ahead-of-time control using grid analytics, forecasting, scheduling, and dispatch to manage DER, either through direct connectivity via the OT interface, or indirectly via Application Programming Interface (API) interfaces and secure public internet.

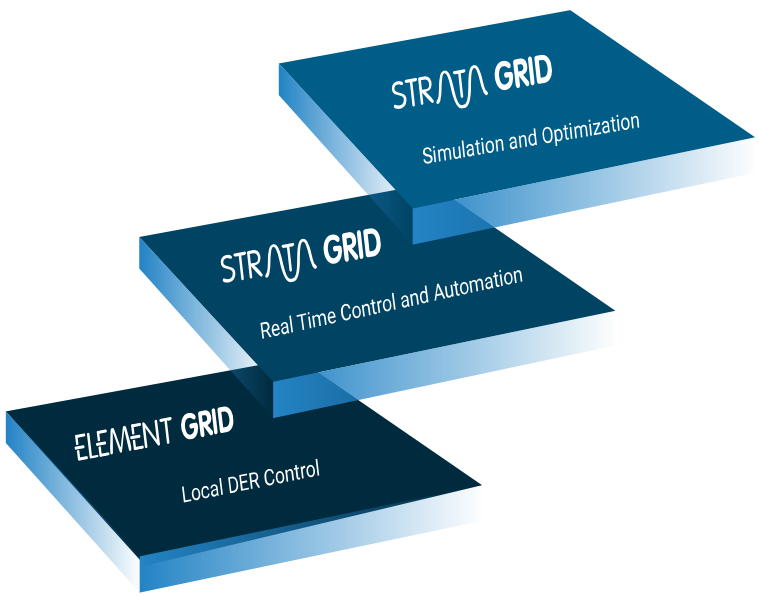
This layered combination of leading control methods and technology agnostic approach means that Strata Grid can manage all sizes and types of DER in wide geographical locations across multiple time horizons. Strata Grid accelerates DER integration and unlocks their stacked benefits while ensuring secure grid operations.

UNIQUE, PATENTED, FIELD-PROVEN

WHAT MAKES STRATA GRID UNIQUE?

Our unique approach to DERMS, using data, communications, analytics and control technologies to continuously execute sub-second decisions, combines best in class control methods in one comprehensive platform.

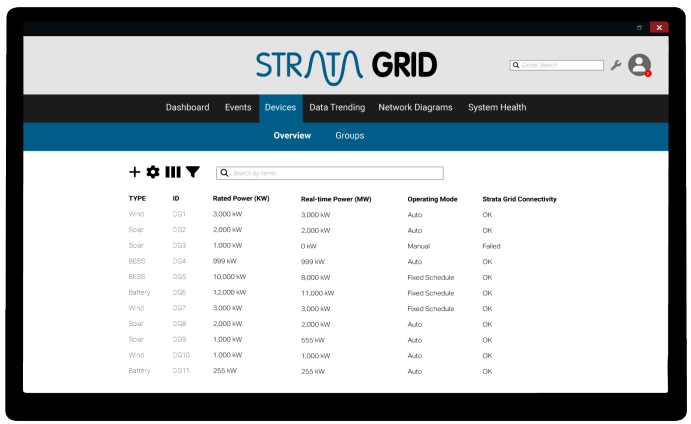
This combination of leading control methods means that Strata Grid can monitor and control all sizes and types of DER, and integrate to a wide variety of grids and markets globally, managing DER across multiple operational time horizons to deliver secure grid operations while optimizing customer value. Strata Grid enables communication with individual assets and groups of assets using a variety of standard protocols that scale to millions of devices.



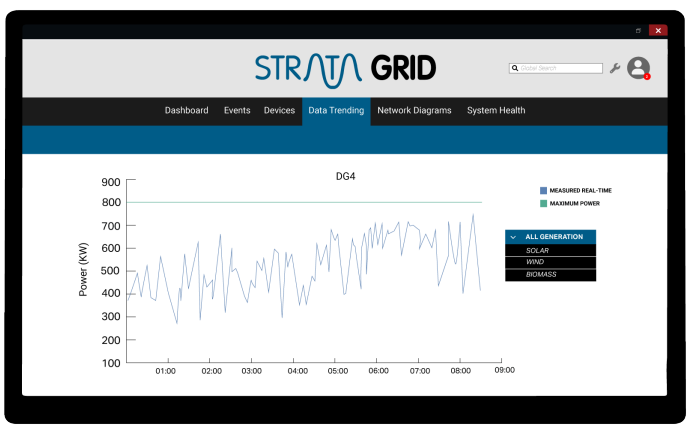
Strata Grid provides the capabilities required to transition to a DSO/ DSP including:

- DER provisioning, monitoring, data acquisition, device and grid visibility and reporting
- Managing grid hosting capacity in real-time through Flexible Interconnections
- Delivering Non-Wires Alternatives (NWAs) and flexibility services
- Coordinating aggregated control and flexibility services for ISOs and markets
- Providing advanced data analytics for forecasting and grid optimization
- Integrating and managing low carbon technologies on the path to 24/7 net zero
- Rich device and system integration to adapt, extend and modernize grid operations

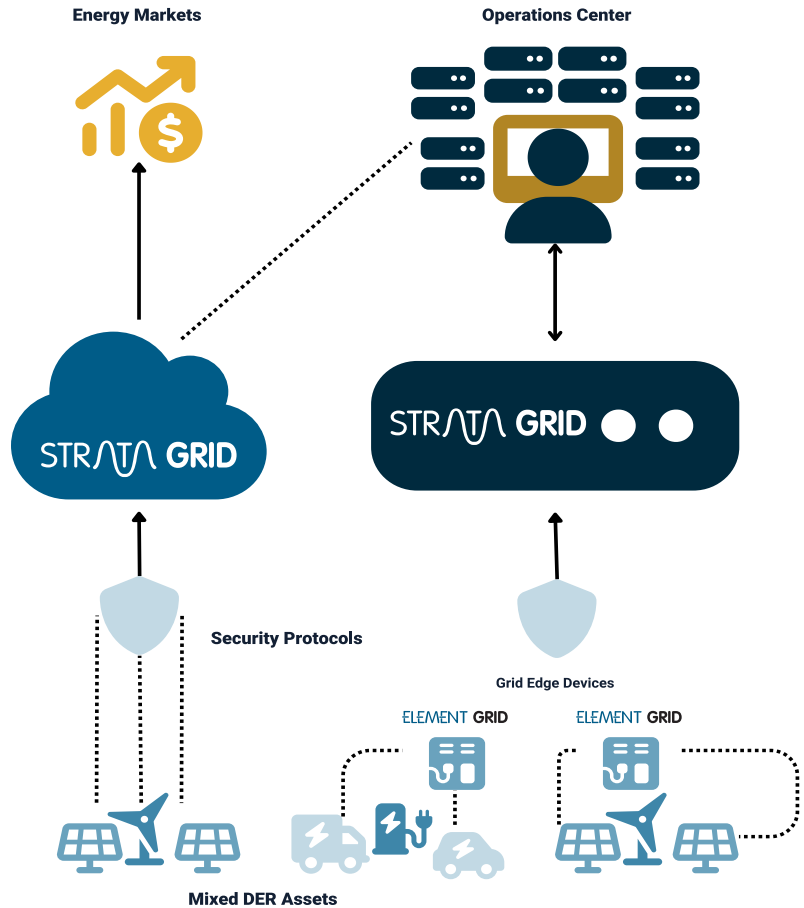
REFERENCE ARCHITECTURE



Devices Overview



Data Trending

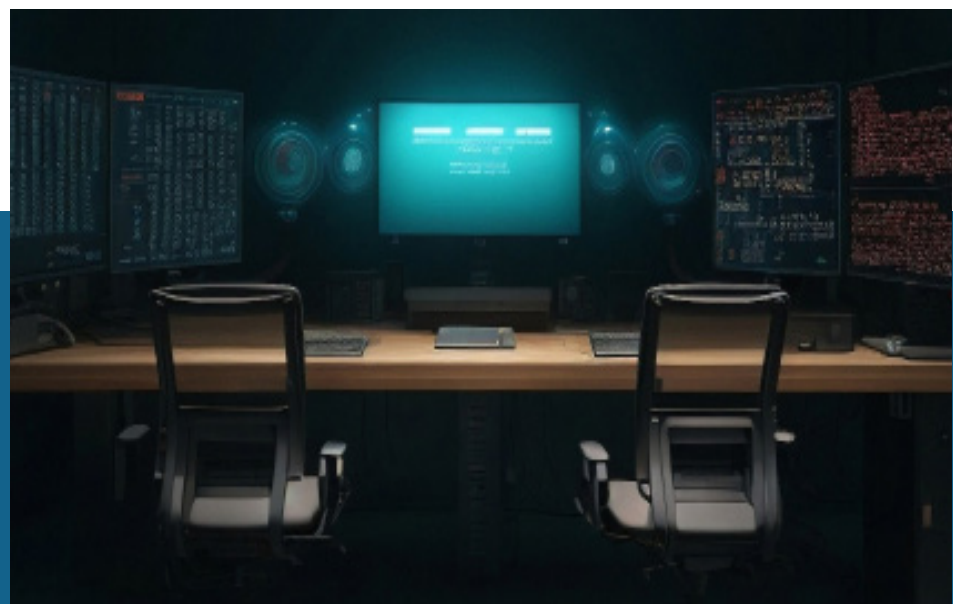


HOSTING ENVIRONMENT AND SECURITY

Strata Grid is designed to be deployed within a utility's IT/OT environment on ruggedized or other virtual bare metal within a substation or control room. Alternatively, Strata Grid can also be deployed within the utility's own cloud infrastructure.

Strata Grid has been independently penetration tested to ensure compliance with industry security standards, and our products are based on an established and accepted set of 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 INTEGRATIONS

- Multiple use case, broad-scope utility DERMS interfacing to energy assets, the grid, and markets to unlock the true value of DER.
- Fast-acting, automated dispatch and threshold-based deterministic control
- Front-of-the-meter (FTM) and Behind-the-meter (BTM) DER integration
- Utility and 3rd party asset integration
- Direct DER and aggregator integration
- ADMS Integration
- Grid analytics
- Forecasting
- Optimization with automated scheduling/dispatch
- DER portfolio management and aggregation
- Wholesale, ancillary service and flexibility market interfaces
- Operator and end-user portals
- Data visualization, analytics and configurable reporting for performance monitoring and regulatory compliance
- Automated configuration from online analysis
- Flexibility service program management
- Asset registration and provisioning
- Preventative control - scheduling and dispatch
- Corrective control – real-time automation
- Asset registration and provisioning
- Fail-to-Safe controls including DER automation at the edge (Element Grid)
- Reporting

ACTIVE GRID CONSTRAINT MANAGEMENT

Autonomously control DER against local grid constraints such as thermal and voltage limits to enable dynamic hosting capacity in real-time, maximizing DER penetration while preserving the integrity of the network. Our patented time bounded, deterministic method of DER control ensures predictability and repeatability, and can be used to unlock new business models such as flexible interconnections.

GRID CAPACITY MANAGEMENT

Strata Grid provides solutions for bi-directional power flows, voltage management, and other hosting capacity limitations created by utility scale and residential distributed generation and other DER. The relevant grid data is read in real-time and accesses analytics ahead of real-time to enable calculation and robust execution of device setpoints to maintain grid security while increasing headroom for DER interconnection and operation.

DEMAND RESPONSE AGGREGATOR DERMS

Strata Grid provides a separate modular capability to coordinate and manage multiple utility Demand Response programs to mitigate peak loading events. Through native product capabilities and integration with third-party platforms, the end-to-end customer and device management to reporting processes can be enabled and coordinated with other DER and flexibility use cases.

FLEXIBLE INTERCONNECTIONS

Strata Grid accelerates the time to interconnect and avoids expensive grid connections for utility scale, front-of-the-meter, or smaller, behind-the-meter DERs. The robust, secure control capabilities allow utilities to safely extend grid hosting capacity to meet customer and regulatory expectations while adhering to different interconnection limits, accelerating DER penetration and enabling new utility business models and revenue streams. The real-time control approach has been shown to extend hosting capacity by 50% to 200% over conventional interconnection limits.

NON-WIRES ALTERNATIVES AND FLEXIBILITY SERVICES

Strata Grid provides an integrated approach for implementing and managing the alternatives to grid asset upgrades by delivering flexible operation of third-party and aggregated DER. Integrating those customer assets and data with markets and utility systems ensures that DER control delivers reliable non-wires solutions and meets the needs of the grid. Strata Grid's core differentiating ability to co-manage local grid constraints and market participation is enabled by layering SGS' cloud-based market integration functionality, allowing for increased DER management capability and third-party integrations. Integration to customer data and market platforms enables customers to use Strata Grid to meet FERC 2222 requirements and manage DER aggregations where DER are able be grouped dynamically by the user (e.g. by DER type, zone substation, or ISO node). This provides a single platform for DSOs/DSPs to manage customer and third-party provided flexibility services.

ADVANCED DER OPTIMIZATION

Strata Grid brings together best-in-breed technologies and techniques that interface with grid and market data to maximize the grid value of DER for multiple, stacked services and use cases. Strata Grid 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 (3rd 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 target use cases. Our diverse real-world experience in operationalizing advanced analytics ensures that the DER optimization strategy deployed is suitable for mission critical operations.

NETWORK MODEL ANALYTICS INTEGRATIONS

Strata Grid integrates with several utility standard load flow engines to extract and use key parameters ahead of real-time operations and control. This informs the deterministic DER control loops of the full spectrum of network running arrangements and allows dynamic configuration of the robust-real-time controls to match the current grid state and plausible next events. This industry leading methodology effectively leverages the benefits that network model-based analytics can provide while de-risking its use in operations.

MICROGRID MANAGEMENT

Strata Grid provides the necessary capabilities to deliver utility microgrids and manage customer microgrids to provide localized energy security and grid services. With microgrids increasingly delivering stacked on-site benefits as well integrating to grids and markets to exploit the additional value of the clean energy assets, effective utility integration and management of multiple microgrids is an essential capability of Strata Grid. Microgrids can be established as a discrete control and management entity or as a larger fleet of managed, grid-tied assets.

OPERATIONAL FORECASTING

Strata Grid 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 or other predictive analytics. A fully configurable DER schedule and dispatch engine (implemented securely on agreed platforms and system architecture) supports diverse DER management models that can be configured to specific requirements to provide DER forecasting, optimization, and control, either in isolation or altogether.

DER DEVICE MANAGEMENT

Strata Grid uses industry standard protocols to provide reliable connections to owned and 3rd party assets, either via direct links or aggregator. These include, but are not limited to ICCP, DNP3, Modbus, REST, OpenADR, and SunSpec.

The platform's core differentiating factor is its 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. This unique approach allows for a greater control over a wider range of technologies and grid visibility.

Strata Grid enables individual device control utilizing SGS's grid edge product, Element Grid, or integration with existing DER control systems. Local control provided by Element Grid also delivers robust fail-to-safe features to ensure grid capacity limits are respected.

The User Interface (UI) 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 operating 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.

Real-time network measurements are displayed through the UI, while also providing real-time (down to 15-second) monitoring of individual DERs. In addition, Strata Grid contains an operational data store which records all system actions, calculations, and DER feedback data for reporting purposes and post-delivery analytics to fuel analysis.

REFERENCE PROJECTS

DERMS for Flexible Interconnect Capacity Solutions (FICS), Non-Wires Alternative (NWA), and Smart Inverter Control

Status: Operational

AVANGRID was receiving customer feedback related to the high cost and excessive timescale of DER interconnection being driven by the need for grid upgrades. Using Strata Grid, AVANGRID introduced flexible interconnection methods demonstrated and proven in the UK. Customer interconnection agreements were amended to incorporate the fast-acting, autonomous control methods used by Strata Grid to minimize curtailment actions and accompanying revenue reduction for customers. The initial design phase of the implementation demonstrated the capability of Strata Grid to double grid hosting capacity and reduce customer need for grid upgrade capital expenditure. Customer solar power projects are already operational, leveraging the increased grid hosting capacity.

The same DERMS infrastructure is being used to provide essential grid and DER measurement, monitoring and control capabilities as well as to leverage the potential of smart inverters in grid operations.

DERMS for Flexible Connections, Flexibility Services Dispatch, Grid Optimization and Electric Vehicle (EV) Smart Charging

Status: Operational

UKPN was seeking a utility DERMS platform to provide on-premise DER management, control capabilities and DER flexibility dispatch functionality. The implemented utility DERMS platform was also used to demonstrate active network switching and control of power electronics devices as well as multiple operational methods of smart EV charging.

Using a combination of its Strata Grid and Cirrus Flex product implementations, SGS deployed the technology infrastructure to deliver an end-to-end automated flexibility services optimization and dispatch platform, which enables multiple flexibility services and providers, implemented in a single system including market platform integration. Strata Grid issues the automated demand turndown dispatch instructions, and Cirrus Flex supports the DSO user through the bidding process to assess and select the required response of Fleet EV to various simulated demand turn down schedules. Strata Grid has also been rolled out across all of UKPN's license areas serving 8 million customers to provide a flexible connection option to all large-scale DER customers.

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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