smarter grid solutions

A Mitsubishi Electric company

STRATA RESILIENCE

SOFTWARE-BASED MICROGRID MANAGER
THAT DELIVERS GRID CONNECTED, ISLAND
AND BLACK START OPERATIONS

STRATA RESILIENCE

Product Overview

Strata Resilience is a software-based microgrid manager that manages, optimizes, and controls Distributed Energy Resource (DERs) in order to enable grid connected, islanded, and black start operations. Deployed on ruggedized hardware on-site, it offers both localized energy resiliency and the opportunity to unlock stacked revenue through intelligent management of DERs. This allows customers the ability to maximize the value of microgrid assets by enabling grid services, electricity market participation, and the optimization of assets.

The role and importance of microgrids as a means of addressing energy and price security through low carbon technologies is increasing. Exposed communities and the power industry at large seek to harden power supplies in the face of increasingly severe weather patterns and extreme events. The deployment of microgrids must fuse expert technical design with solid business case development to ensure adequate capacity and robust performance through fast-acting, grid-forming and market integrated DER, all managed by Strata Resilience. Additional stacked values can then be unlocked through the use of advanced analytics and optimization.

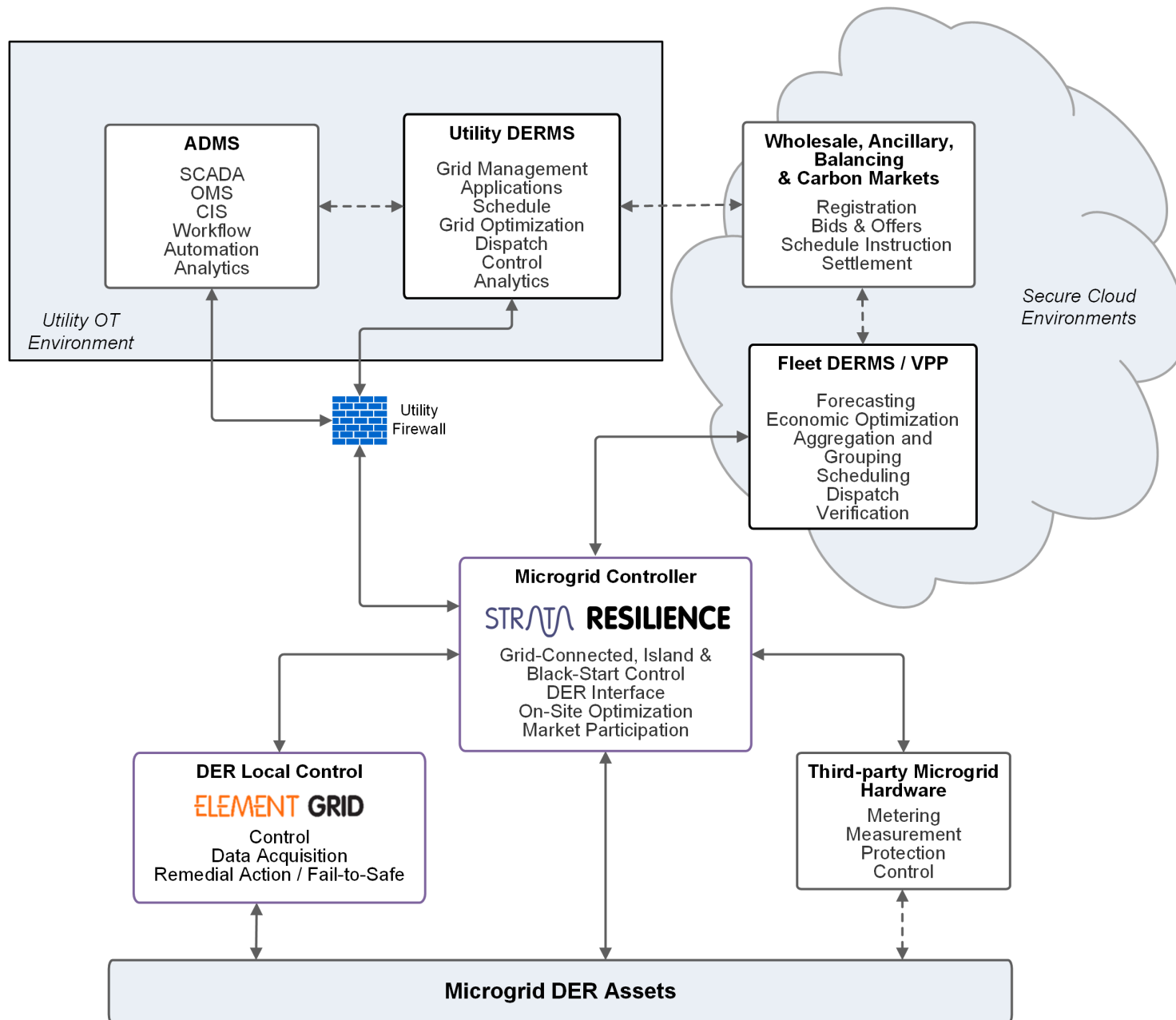## What makes Strata Resilience unique?

Microgrid manager software that coordinates fast-acting local DER controls, grid integration and market participation to deliver the necessary parts of a sophisticated, resilient and value adding microgrid.

- Streamlined design and coordinated control of microgrid DER to provide localized energy security

- Maximized utilization, on-site value and revenues from microgrid DER assets while grid connected or islanded

- Leveraged protection, control and synchronising hardware for seamless island transitions and operations

- Coordinating aggregated DER control and flexibility for grid and ISO market services

- Enabling the management and control of DER to participate in energy markets

- Advanced analytics including forecasting and configurable optimization strategies ruggedized for operational environments.

- Management of multiple microgrids through communications direct to energy assets, front-of and behind-the-meter, individual devices, hybrid sites and DER aggregations.

- Open data access storing and providing all of the data needed for performance reporting and financial settlement

- Integrating and managing low carbon technologies for 24/7 net zero microgrid operation

- Rich device and system integration to adapt, extend and modernize grid operations

Strata Resilience coordinates fast-acting local DER controls, grid integration and market participation to deliver the necessary parts of a sophisticated, resilient and value adding microgrid.

Reference Architecture

ADMS

SCADA
OMS
CIS
Workflow
Automation
Analytics

Utility DERMS

Grid Management
Applications
Schedule
Grid Optimization
Dispatch
Control
Analytics

Utility OT Environment

Utility Firewall

Wholesale, Ancillary, Balancing & Carbon Markets

Registration
Bids & Offers
Schedule Instruction
Settlement

Secure Cloud Environments

Fleet DERMS / VPP

Forecasting
Economic Optimization
Aggregation and Grouping
Scheduling
Dispatch
Verification

Microgrid Controller

STRATA RESILIENCE

Grid-Connected, Island &
Black-Start Control
DER Interface
On-Site Optimization
Market Participation

DER Local Control

ELEMENT GRID

Control
Data Acquisition
Remedial Action / Fail-to-Safe

Third-party Microgrid Hardware

Metering
Measurement
Protection
Control

Microgrid DER Assets

Hosting Environment and Security

Strata Resilience is designed to be deployed on hardened IT/OT equipment deployed in physically secure locations from utility substations to on premise sites. It can be deployed to ruggedized bare metal compute platforms with elements hosted in a secure virtual private cloud or external cloud-hosted environment, or a combination of these to ensure both security and control integrity. This layered, platform-agnostic approach exploits inherent technology capabilities to provide enhanced levels of performance, resiliency, and security while ensuring horizontal and vertical scaling as requirements and deployment evolve.

Compliance with industry standards is ensured through independent penetration testing. Our products and deployments are based on established security architecture best practices, including but not restricted to the following:

- Hardware and software redundancy 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

Multiple use case, broad-scope microgrid manager DERMS interfacing to microgrid energy assets, protection and control equipment, the grid, and markets to unlock the true value of DER.

Pre-Island DER optimization and preparation

Island formation (seamless transition and black start capability)

In-island DER optimization

Re-synchronisation with synchronising system integration

Black start sequencing (remote and automatic with local logic)

Fast-acting, automated dispatch and threshold-based deterministic control for generation, storage, and load management (with critical load prioritization)

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

Protection and switchgear integration (e.g. relaying, grid forming inverter, PCC controller, switching devices)

Owned and 3rd party asset integration

DER, grid and market operational forecasting

Aggregated microgrid DER portfolio management and optimization (revenues, costs and CO_2) with automated scheduling/dispatch

Local, regional and national market interfaces and user interactions (relevant to FERC 2222 alignment)

Utility systems Integration

Operator and end-user interfaces and app integration

Data visualization, analytics and reporting for performance monitoring and settlement

Automated scheduling and dispatch

Real-time energy asset monitoring, control and automation

Fail-to-Safe controls including DER automation at the edge (Element Grid)

Measurement and verification of asset performance

DER service delivery settlement and management reporting

Microgrid Management

Strata Resilience provides the necessary coordination and management capabilities to deliver utility or customer microgrids that can 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. Microgrids can be established as a discrete control and management entity or as a larger fleet of managed, grid-tied assets.

DER Device Management

Strata Resilience integrates with diverse DER using industry standard protocols to provide reliable connections to owned and 3rd party assets, either via direct links or an aggregator. These include, but are not limited to ICCP, DNP3, Modbus, REST,

OpenADR, and SunSpec. Our technology agnostic approach to integration provides the ability to manage and control diverse DER including PV, wind, energy storage, and diesel generators.

Individual device control is enabled through SGS's grid edge product, Element Grid, or via direct integration with existing DER control systems. Local control provided by Element Grid also delivers robust fail-to-safe features to ensure microgrid limits are respected.

The configurable User Interface puts power in the hands of the operator to monitor and control DER within the microgrid by leveraging fully customizable and shareable dashboards built using a set of re-usable widgets. These dashboards can provide real-time monitoring of both the network and individual or aggregated DER (down to 15-second).

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

In addition, Strata Resilience contains an operational data store which records all system actions, calculations, and microgrid and DER performance data for reporting purposes and post-event analytics to fuel analysis and refinement.

Operational Forecasting

A built-in ruggedized operational load and generation forecaster provides localized situational awareness and can subsequently power DER optimization and other predictive analytics. It can integrate with external weather forecasting API's and incorporate real-time telemetry. A fully configurable DER schedule and dispatch engine supports diverse DER management models that can be configured depending on the requirements to provide DER forecasting, optimization, and control, either in isolation or altogether.

Advanced DER Optimization

Strata Resilience brings together best-in-breed technologies and techniques that Strata Resilience helps customers realize pragmatic optimization strategies suited for operations by bringing together best-in-breed technologies and techniques to interface with DER, grid, market and third-party system data to maximize the value of DER. Our product hosts a configurable optimization application that enables customers to specify objectives that fit their specific operational strategies and optimize any mix of 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 engine, 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 microgrid and DER optimization strategy deployed is suitable for mission-critical operations.

Non-Wires Alternatives, Flexibility Services and Grid Constraint Management

Strata Resilience provides an integrated approach for implementing and managing microgrid DER to unlock a variety of Non-Wires Alternatives and advanced grid services. This enables alternatives to grid asset upgrades by managing customer and third-party assets for load relief and accelerate DER penetration through active real-time management of DER within local grid constraints.

Integration to customer data and market platforms enables Strata Resilience to meet FERC 2222 requirements and manage aggregations where DER are able be grouped dynamically by the user (e.g. by separate microgrid, DER type, zone substation, or ISO node). This provides a single platform to manage customer and third-party provided flexibility services from microgrid assets.
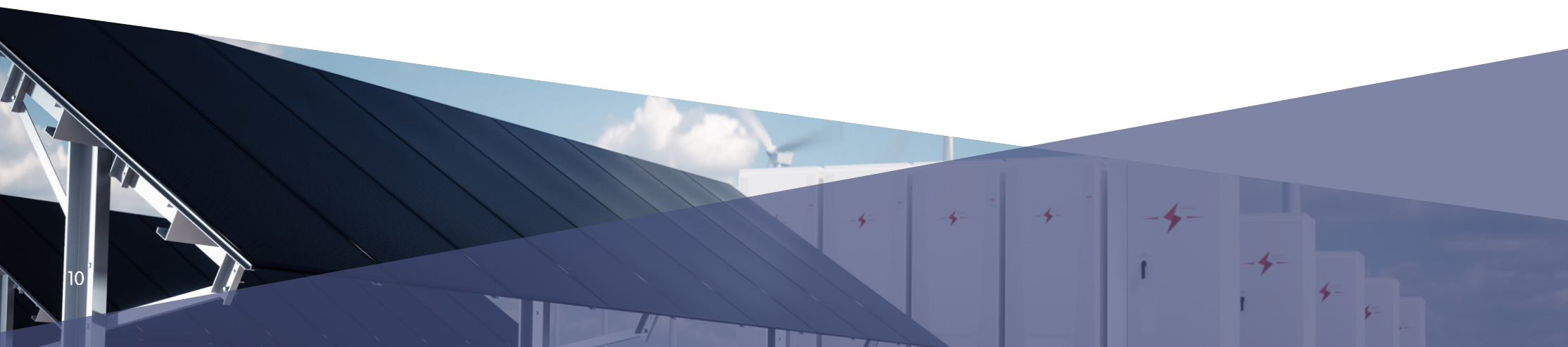
Reference Projects

Shetland Islands Microgrid

Status: Operational

The Shetland islands grid was mostly powered by fossil fuel resources but increased renewable energy sources were planned. System design and operational challenges resulted from renewable intermittency with the accompanying balancing and stability issues, as well as system security, voltage management and thermal constraints.

Strata Resilience provides the autonomous controls required and has enabled the integration of 12 MW of new distributed energy assets including wind generation, tidal power, battery energy storage and residential electric heating demand response. There have been significant carbon emission reductions from the legacy fossil power generation over several years of operation.

The Shetland Islands microgrid was commissioned into operation in 2013.

Microgrid Manager and Controller for Lac-Mégantic Microgrid

Status: Operational

The Town of Lac-Mégantic, Quebec, Canada suffered a catastrophic rail disaster in 2013 when an oil transport train derailed in downtown. Following this disaster, Lac-Mégantic re-envisioned the town as a technological and economic innovation smart city. Hydro Québec, agreed to construct a microgrid in the downtown area to fulfil the smart city vision and prepare for the larger provincial energy transition.

The Lac-Mégantic microgrid incorporates a 600 kW / 600 kWh grid forming battery, a 524 kW PV System, an 855 kW diesel generator and 6 commercial buildings with a mix of building management systems, PV and batteries.

Strata Resilience provides the microgrid management and control functionality including:

- Seamless planned and unplanned island operation utilizing diverse load and generation assets
- Island transition management including pre-island capacity management and black-start functions
- Unplanned islanding and resynchronization co-ordination with network protection and DSO operations
- Behind the meter asset operation for system peak and local peak reduction of batteries and aggregated DER
- Microgrid network constraint management in island and grid-connected modes
- Aggregated DER management and additional DER and functionality scalability
- Optimization strategies to support the renewable energy transition for remote communities.

The Lac-Mégantic microgrid was commissioned into operation in 2021.

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