

Smart Buildings

Schneider Electric Leads The Charge On The Democratization Of Energy

By Ben Hext
With Rodolphe D'Arjuzon

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Increasing the grid interactivity of facilities is becoming a key enabler for decarbonization as more renewables are onboarded, both at the grid scale and on site, and uptake of electric vehicles (EVs) becomes more widespread (see [Verdantix Market Overview: Technologies For Grid-Interactive Buildings](#)). Microgrids form a vital part of the grid-interactive ecosystem, enabling the site-level management of distributed energy resources (DERs) and communication with the grid to optimize energy flows for cost-cutting, decarbonization and energy resiliency. This report analyses Schneider Electric's EcoStruxure offerings and services for microgrid control and management and examines how the firm can support customers adapting to a rapidly changing energy landscape.

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Organizations mentioned

ACCIONA Energía, AlphaStruxure, AutoGrid, Black & Veatch, Blocklab, BloombergNEF, Brookville Smart Energy Bus Depot, Carlyle, Citycon, Claroty, GreenStruxure, Huck Capital, International Renewable Energy Agency (IRENA), Lidl Finland, Montgomery County, Ponemon Institute, Port of Long Beach, Port of Rotterdam, S&P Global Platts, San Diego Gas & Electric, Schneider Electric, UK Government, US Marine Corps.



Microgrids Are The Enabler For A Grid-Interactive Future

Increasing the grid interactivity of facilities is becoming a key enabler for decarbonization as more renewables are onboarded, both at the grid scale and on site, and uptake of electric vehicles (EVs) becomes more widespread (see [Verdantix Market Overview: Technologies For Grid-Interactive Buildings](#)). Microgrids form a vital part of the grid-interactive ecosystem, enabling the site-level management of distributed energy resources (DERs) and communication with the grid to optimize energy flows for cost-cutting, decarbonization and energy resiliency. This report analyses Schneider Electric's EcoStruxure offerings for microgrid control and management. To learn more about Schneider Electric's solutions, Verdantix toured its Chippenham facility.

Grid Interactivity Is Key For Decarbonization And Resiliency

Ten years ago microgrids were most suited to large critical facilities, such as military bases and hospitals. However, technological advances and price reductions have opened the market to any building with a battery, EV charging point, solar panels or combined heat and power plants (CHP) (see **Figure 1**). Today the key operational benefits of grid interactivity that are driving uptake of microgrids within commercial facilities are:

- **Smarter use of renewable energy and EV charging to decarbonize operations.**

The rapid rise of CEO-led net zero carbon goals is forcing firms to examine the carbon emissions of their real estate portfolio and consider DER technologies such as on-site renewables, battery storage, and EV charging points (see [Verdantix Best Practices: Planning For Net Zero Carbon Buildings](#)). For example, Schneider Electric partnered with ACCIONA Energía to install a microgrid at its factory in Spain, consisting of 852kWp of PV generation, five EV charging points and 80kWh of battery storage to decarbonize operations. In the Verdantix global corporate survey, 29% of respondents are making new investments in on-site generation and storage technologies (see [Verdantix Global Corporate Survey 2021: Smart Building Technology Budgets, Priorities & Preferences](#)).

- **Flexible energy consumption to reduce power costs.**

Global energy prices are quickly rising and have hit record levels in some regions during the first half of 2022 due to rising demand and supply disruption to fuel. Grid operators are increasingly using pricing signals and incentives to encourage users to adjust their consumption in a way that lessens strain on the power grid, such as payments for reducing energy consumption during periods of high demand. For example, in periods of high electricity demand and high prices, a microgrid-enabled facility could consume on-site generated and stored electricity or sell power back to the grid to save energy costs and receive payments from the grid operator. As a result, the return on investment of grid-interactive technologies is becoming more attractive as energy prices rise, financial incentives improve, and technology prices continue to decline.

- **On-site generation and storage to boost facility resiliency.**

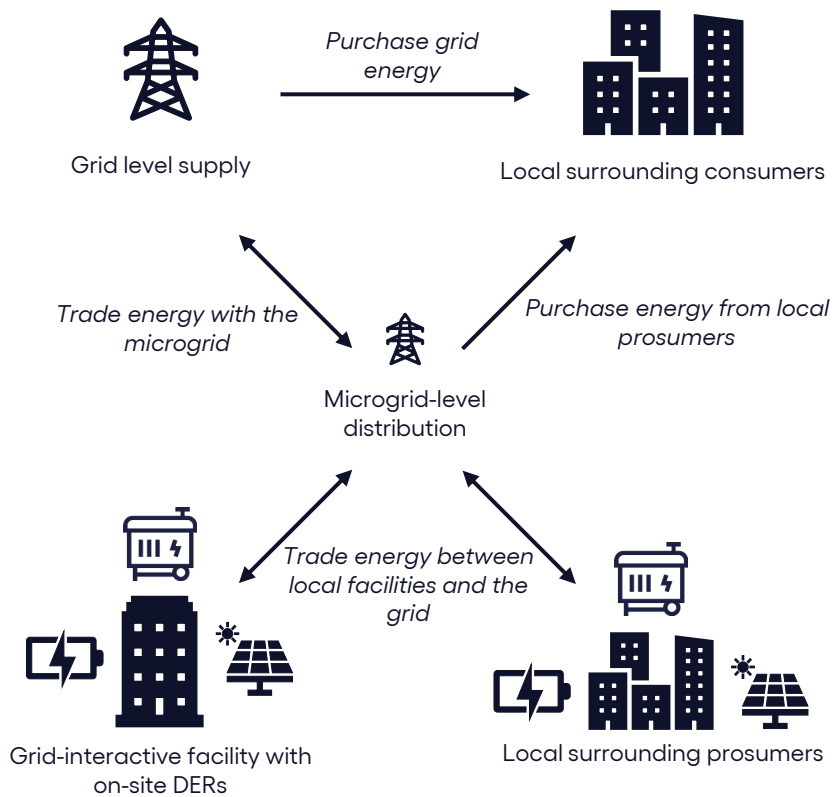
Globally, severe weather and ageing grid infrastructures increase the risk of energy blackouts. In the US the likelihood of a power outage due to extreme weather has doubled over the last two decades. As a result, it is becoming more important to boost on-site energy resiliency with generation and storage options to mitigate disruption to businesses. For example, the Port of Long Beach in California, implemented a microgrid with Schneider Electric to improve the port's energy resilience with a system that includes a 300kW PV solar panel array and a 250kW stationary battery energy storage system (BESS).

- **Site capacity increases without grid-level investment.**

Facility and vehicle electrification is increasing as firms look to shift away from consuming fossil fuels. As a result many sites will be required to upgrade their site electricity capacity in partnership with the grid operator,



Figure 1
An Overview Of Microgrid-Level Electricity Distribution



Source: Verdantix analysis

which can be costly and disruptive to operations. Microgrids are emerging as a viable alternative to boosting direct grid capacity by using on-site generation and storage to virtually increase capacity without modifying existing energy supplies. For example, the US Marine Corps's air station in Miramar installed a microgrid with Schneider Electric that alleviates load from the local utility, San Diego Gas & Electric, enabling more reliable power for surrounding residents.

The Market For Microgrids Is At A Turning Point As We Enter Energy Democratization

Increasing the grid interactivity of facilities is a growing focus area for firms looking to decarbonize real estate, reduce power costs, boost energy resiliency, and increase electricity capacity. Microgrids enable facilities to boost interaction with the grid and implement on-site generation and storage alongside grid-level demand response programmes. In addition to the growing operational benefits for firms operating microgrids, there are several key enablers opening the market to a more diverse range of customer and facility types; the key enablers are:



- **Peer-to-peer trading is democratizing power generation.**

The installation of on-site DERs is leading to a rise in electricity prosumers, a facility that both consumes and produces energy. This enables firms to take a step back from grid reliance and become more involved in the energy system. Virtual power plants (VPPs) are an emerging concept where independent sites with on-site DERs can flexibly distribute energy amongst themselves through peer-to-peer (P2P) energy trading or back to the grid (see [Verdantix Market Overview: Technologies For Grid-Interactive Buildings](#)). P2P energy trading enables energy prosumers and consumers to participate in a local marketplace to trade energy without an intermediary, leading to a more decentralized and democratized power system.

- **Facilities can monetize energy assets for alternative revenue streams.**

As the grid democratizes, facilities with microgrids can increasingly become involved in virtual power plants with P2P trading or grid buy-back schemes, opening up new revenue streams to participants. For example, the Port of Rotterdam implemented an electricity trading system, developed by Blocklab and S&P Global Platts, across its microgrid. This system enables local participants to trade renewable energy without input from the direct grid. As a result, energy consumers reduced costs by 11%, and energy prosumers increased electricity revenues by 14%.

- **Falling technology prices and rising energy costs are fuelling a more attractive ROI.**

Falling technology prices for solar PV, BESSs and microgrid management software, alongside rising energy prices, are leading to a more attractive return on investment (ROI) for microgrid installations of around five to seven years for some facilities. BloombergNEF recorded that lithium-ion battery prices fell 80% between 2010 and 2017; the International Renewable Energy Agency (IRENA) recorded that solar PV prices fell 65% between 2010 and 2017. As the grid becomes more distributed, it will also be easier for prosumers to sell excess energy, leading to greater returns.

- **Solution providers are offering innovative financing schemes to counter CAPEX concerns.**

Microgrids often require high upfront capital expenditure (CAPEX) and an ROI greater than five years, erecting a barrier to investment for many firms. However, technology providers are starting to offer energy-as-a-service (EaaS) propositions where the provider funds the upfront cost of the installation, which the customer repays over time. These schemes transfer risk onto the technology provider as repayments are often reliant on minimum performance requirements for energy or emissions savings. For example, in August 2020 Schneider Electric launched GreenStruxure in partnership with investment firm Huck Capital to offer an option to deploy on-site microgrids using an EaaS agreement. In 2019 Schneider Electric partnered with private equity firm Carlyle to launch AlphaStruxure, an EaaS firm for microgrids and EV charging.

Schneider Electric's Microgrid Offerings Give Firms New Options In A Changing Energy Landscape

Demand for grid interactivity and a more democratized power grid is driving the uptake of microgrids as businesses look to decarbonize on-site operations, reduce energy costs and boost business resiliency. Founded in 1837, Schneider Electric offers a comprehensive suite of hardware, software and services for energy management and automation in infrastructure to enable sustainable, reliable and efficient operations (see [Verdantix Schneider Electric Positions EcoStruxure As The Backbone Of A Smart Building Strategy](#)). To help its customers succeed in a changing energy landscape, Schneider Electric offers:

- **Comprehensive solutions for building automation and microgrid management.**

In 2010 Schneider Electric launched EcoStruxure, a comprehensive plug-and-play interoperable platform that provides IoT capabilities through connected products and hardware; edge control software; and apps,



analytics and services (see [Verdantix Green Quadrant: IoT Platforms For Smart Buildings 2022](#)). As part of the EcoStruxure ecosystem, Schneider Electric offers EcoStruxure Grid and EcoStruxure Building modules that deliver targeted control, monitoring and automation capabilities for smart facilities and microgrids. Schneider Electric is constantly upgrading its offering through research and development, acquisitions and partnerships. For example, in May 2022 Schneider Electric acquired AutoGrid, a provider of software for managing networks of DERs, such as solar and battery storage.

- **Products that cater for a wide range of facility types.**

Schneider Electric offers microgrid products designed for a range of facilities. Its product suite caters for large energy consumers, such as hospitals, data centres and manufacturers, as well as smaller consumers such as offices, retail and hotels. Schneider Electric also supports microgrid implementation for communities of buildings, such as city districts, airports and military bases.

- **One-stop services for microgrid and building automation installations.**

Schneider Electric offers the full suite of products and services for microgrid design, implementation and operation. The firm has installed over 300 microgrids to date, with experienced engineers providing site surveys and feasibility analyses, system engineering and design, equipment procurement, system commissioning, training and ongoing maintenance. The Schneider Electric products are designed to be system agnostic, and the firm provides system integration services for multi-vendor systems.

- **Robust cyber security services to mitigate the risk of attack.**

Cyber-attacks on operational technology (OT) are an ever-increasing threat due to the explosion of networked devices, the convergence of IT and OT networks and ageing building systems (see [Verdantix Best Practices: Enhancing Your Smart Building Cyber Security Programme](#)). It is therefore vital to consider cyber security when implementing new OT, especially for critical energy infrastructure. Schneider Electric offers dedicated cyber security services during the design, implementation, commissioning, and operation of EcoStruxure products. In June 2022 Schneider Electric and Claroty, an industrial cyber security firm, launched Cybersecurity Solutions For Buildings to help firms secure their facilities against cyber-attacks.

EcoStruxure Microgrid Advisor Offers Advanced Monitoring And Predictive Controls In A Single Platform

Schneider Electric's EcoStruxure platform offers a diverse range of products suited to multiple facility types and end users. To control and monitor the OT layer, Schneider Electric offers its EcoStruxure Microgrid Advisor product. This application:

- **Provides a single view for site-wide energy flows.**

EcoStruxure Microgrid Advisor is a cloud-based platform that interfaces with on-site DERs, such as solar PV or BESSs, for monitoring, control and optimization (see **Figure 2**). The software also connects with other EcoStruxure Advisor solutions, such as EcoStruxure Building Advisor, to monitor and control other operational systems, such as HVAC or lighting, and conduct fault detection and diagnosis (FDD). EcoStruxure Microgrid Advisor provides facilities operators with a single source of truth for on-site energy flows and enables users to track real-time energy consumption, energy savings and carbon emissions data.

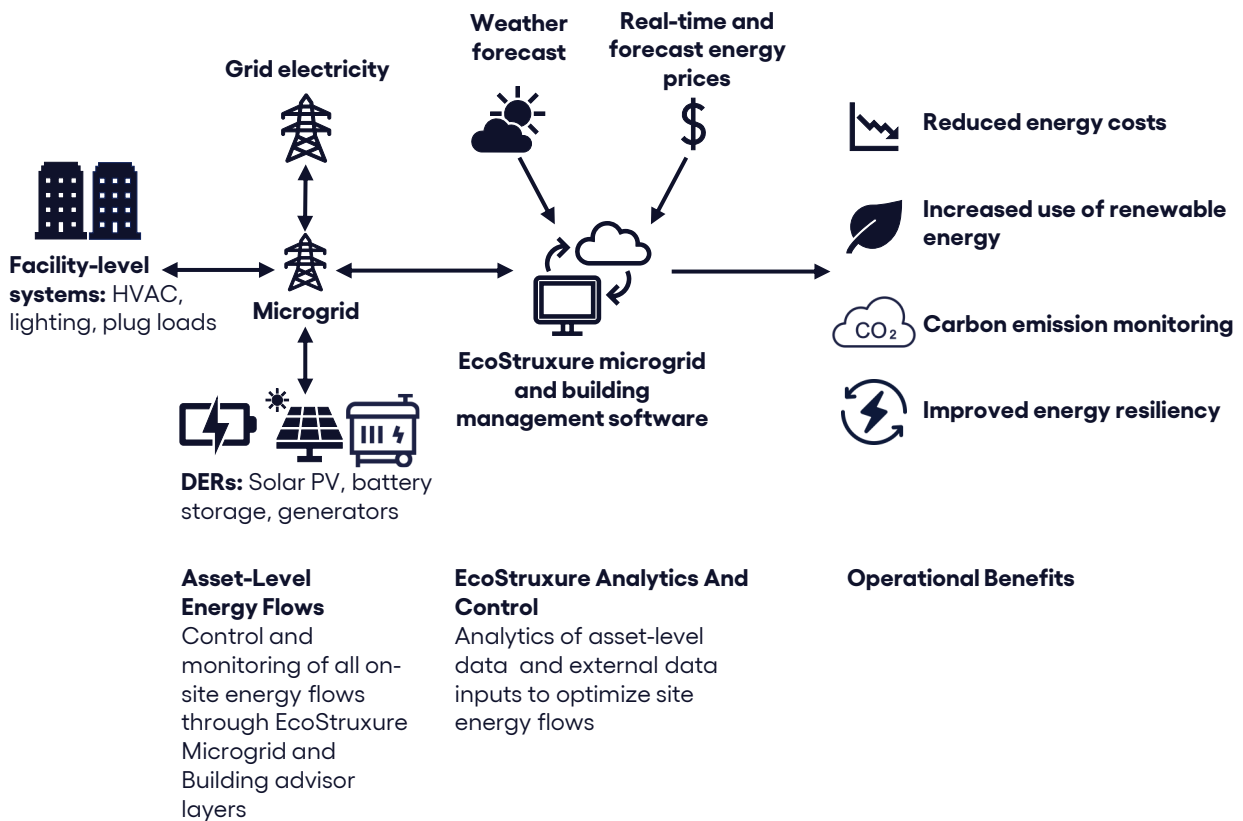
- **Enables real-time demand response to avoid peak electricity charges.**

Facilities can participate in real-time demand response programmes based on energy prices and weather forecasts. EcoStruxure Microgrid Advisor can predict prices and react to sudden fluctuations, enabling firms to flex their consumption and avoid high charges. For example, the flagship Schneider Electric IntenCity building



Figure 2

Facility-Level Energy Flows Handled By EcoStruxure Microgrid Advisor



Source: Verdantix analysis, Schneider Electric

in Grenoble, France can adjust the consumption and storage of renewable energy generated on site to avoid high grid-energy prices.

- Optimizes electricity consumption and generation for resiliency.**
EcoStruxure Microgrid Advisor uses predictive analytics to carefully balance electricity consumption and generation for resiliency. The platform can ingest historical data, weather forecasts, energy market pricing and scheduled operations, such as production or building occupancy, to optimize energy flows in case of grid outages. For example, if a storm is incoming, then energy storage is filled, and non-critical site functions are shut down to minimize impact to operations in case of a blackout.
- Collects, analyses and communicates energy and carbon emission savings.**
Collecting and reporting building energy data is increasingly important for firms needing to measure the success of efficiency programmes, disclose performance to stakeholders and report on firm-wide net zero goals (see [Verdantix Strategic Focus: Defining The Business Value Of Sustainable Real Estate](#)). In the Verdantix



global corporate survey, 47% of respondents stated they were making new investments in reporting building ESG data to stakeholders (see [Verdantix Global Corporate Survey 2021: Smart Building Technology Budgets, Priorities & Preferences](#)). Schneider Electric's EcoStruxure Microgrid Advisor automatically calculates carbon emissions from grid-consumed power and on-site generation, drastically speeding up reporting and increasing accuracy.

Organizations Looking To Optimize On-Site Renewable Energy And Cut Energy Costs Should Consider Schneider Electric

Rising energy prices, the increasing frequency of grid outages and the requirement to decarbonize are pushing energy management to the top of the agenda for many real estate executives. To meet business, stakeholder and regulatory requirements, firms need to invest in their on-site infrastructure and software and consider solutions from technology providers such as Schneider Electric. Prospective customers who would benefit from microgrid solutions are:

- **Critical facilities needing to be resilient against grid failures.**

Critical facilities, such as data centres, hospitals, and manufacturing plants, are particularly sensitive to grid failures. For example, a study by the Ponemon Institute found that the average cost of a data centre outage is \$740,000. As a result, the microgrid business case for these sites is particularly convincing, and firms that operate critical facilities should consider Schneider Electric's microgrid offerings to avoid expensive downtime. For example, the US Marine Corps Air Station Miramar in San Diego installed a microgrid from Schneider Electric and Black & Veatch, an engineering and construction firm. The microgrid connects a variety of DERs, including solar PV and a gas power plant, to ensure continued power access during sustained grid outages of up to 14 days while reducing carbon emissions. The site can also participate in demand response programmes to cut energy costs.

- **Large sites needing to be resilient to rising energy costs.**

Facilities that consume large quantities of energy are very exposed to rising energy costs, which can eat into business revenue and profits. Firms need to mitigate exposure to fluctuating energy prices by exploring on-site generation and storage. For example, Citycon, a real estate owner and developer, is developing a microgrid-enabled city centre, Lippulaiva, in Espoo, Finland in partnership with Schneider Electric. The property will utilize solar PV, BESSs and a smart controls system to create a virtual powerplant that manages energy flows between several buildings to optimize power consumption for energy savings and decarbonization. Schneider Electric and Citycon project the programme will save \$352,000 in energy costs per year with an ROI of 5 years in conjunction with investment aid for new technologies.

- **Sites looking to PV and storage for decarbonization.**

Many businesses are pursuing net zero goals to align with governmental targets, such as the Paris Agreement. Firms looking to implement on-site renewable generation and storage as part of wider corporate decarbonization goals should consider Schneider Electric's microgrid offerings. For example, Lidl Finland installed a microgrid from Schneider Electric at a 60,000m² distribution centre, constituting 1,600 solar PV panels, a BESS, advanced IoT-enabled building controls and EcoStruxure Microgrid Advisor to control energy flows and optimize energy costs and emissions. Schneider Electric project that the facility will reduce energy consumption by 50% and enable 100% renewable energy consumption through the on-site generation and clean energy purchase agreements.



- **Businesses wanting to install EV charging for employee and fleet vehicles.**

Governments worldwide are introducing a shift from fossil fuel vehicles toward EVs. For example, the UK government has banned the sale of new fossil fuel cars after 2030, and from 2022 all non-residential buildings undergoing major renovation or construction must have 20% of parking spaces equipped with EV charging. Firms that need to install EV charging should consider microgrids for virtually increasing site electricity capacity and managing charging networks. For example, Montgomery County is deploying a microgrid for EV charging at the Brookville Smart Energy Bus Depot through an EaaS agreement with Schneider Electric's AlphaStruxure. The microgrid integrates solar PV canopies, BESSs, EV chargers and control software to deliver reliable charging to a fleet of 44 electric buses. Schneider Electric estimates that the project will cut carbon emissions by 62% and enable the county to maintain bus services during power outages.



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Contact

verdantix Ltd, 18 Hatfields, London
SE18DJ, United Kingdom

contact@verdantix.com
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