Site energy management and optimization

How to become more energy efficient

5G services have now been launched and are providing faster connectivity and new capabilities to enterprises and users worldwide. The shift that 5G promises must be sustainable from an energy and business perspective. It will be achieved by solutions allowing service providers to effectively and intelligently manage the energy consumed at their sites — and, increasingly, the renewable energy generated there.

The telecommunication sector can do more to reduce its environmental impact and has a significant role in addressing global sustainability goals. The way to break the energy curve* is by investing in a more energy-efficient network build. By using the latest generation of Ericsson's energy-efficient Radio Access Network (RAN) hardware and software solutions, service providers can achieve greater energy performance with equipment that consumes much less electricity. Ericsson Radio System (ERS) Enclosure and Zero Footprint site solutions reduce energy consumption and CO2 emissions compared to inhouse sheltered solutions. The software also plays an important role: new solutions for an advanced low-energy sleep mode will ensure site equipment only consumes energy when needed, keeping the sites' total consumption to an absolute minimum.

Today, most network sites are powered by the grid, and some have various backup power systems in place. Onsite energy generation is typically solved with diesel generators, while lead-acid or modern li-ion batteries provide energy storage. This has been sufficient, but when grid power becomes more expensive and less reliable, connectivity service providers must invest in energy storage and manage the energy they use more rationally to secure service and maintain profitability.

Full control with Ericsson Network Manager
Supporting this shift is the Ericsson Network Manager (ENM), a single unified intelligent management system which provides full control over every aspect of the network sites, from overall site performance to site energy management. It also supports intelligent site infrastructure operations that increase visibility.

The modern power system can manage and optimize all the energy sources in a hybrid environment. Thanks to these solutions, site energy management has the potential to create significant cost savings both now and in the long term, especially in times of soaring energy prices.

Zero Footprint site with energy storage on rail

*As we move towards 2025, Ericsson believes it is possible to scale up 5G, while simultaneously reducing total network energy consumption. Our approach is described in the report, On the way to breaking the energy curve.

What is site energy management?

The Ericsson Network Manager gives connectivity service providers total visibility and control of their core, transport, radio, and hybrid power management, including renewables. It is a fully integrated system that provides a clear picture of the network's capabilities, capacity and performance, as well as its individual sites—while seamlessly managing the energy supply via the same familiar interface.

Dynamic optimization of site energy

True network resilience against spikes in energy prices is created by basic peak energy control and peak load shifting. With these approaches to dynamically managing energy, on-site batteries can step in providing power when grid demand is peaking or during certain times. This will ensure consistent service and always-on mobile network service for users as well as lower energy costs for providers.

Via applications based on ENM and with the help of policy-based energy management, the site's energy sources will depend on factors such as the time of day, energy availability, and weather conditions.

The system provides uninterrupted, resilient site and network performance with the possibility for a high level of independence from fossil fuels, volatile energy costs and service visits.

Resilient operations with a new energy mix

Many connectivity service providers have set ambitious targets to reach carbon neutrality by 2030 and Net Zero by 2050.* Reduction in emissions is another key benefit of site energy management.

The shift to sustainable connectivity will be enabled partly by efficient hardware and the smart use of electricity. An even bigger impact can be made when renewables are added to the onsite energy mix, with solar panels or even wind turbines placed within the site itself. Sites like this are already in use and sustainably maintaining networks across the world. If implemented more widely, they can greatly help minimize networks' impact on the environment. Onsite renewable energy sources can provide backup power at rural sites, but their impact is just as great in cities, where the pressure on the energy grid is highest.

Reach carbon neutrality by

2030

and Net Zero by 2050

Remote site management via a site controller and the Ericsson Network Manager boosts resilience and reduces emissions even further. Power consumption settings, software upgrades and battery tests can all be controlled and initiated by the service provider remotely without the need for on-site intervention. This brings down emissions related to service visits and improves uptime by allowing service providers to quickly resolve issues at the site. In addition, remote battery tests make it possible to build a cost-efficient battery fleet management system. Remote testing lets service providers assess battery health at their sites without physically being there — a better image of the battery network's performance can be captured, and unexpected loss of service due to unknown battery health can be kept to a minimum.

*61% of the mobile industry by revenue have committed to Net Zero by 2050 or earlier. Source: GSMA 2023

Smart and sustainable 5G sites
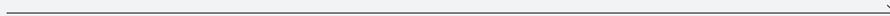

| Reduce energy consumption | Add solar and wind | Enable smart energy | Gain new income |

Today ——————————————→ Future

Relentless optimization of performance, energy and carbon footprint

Energy-efficient hardware

A major share of the total energy reduction will be achieved with efficient, convection cooling equipment. Ericsson's Zero-Footprint hardware and ERS enclosure sites will take up less space compared to inhouse sheltered sites. The equipment will be housed in energy-optimized cabinets or rail mounted instead of traditional shelters or equipment rooms. Heat exchangers, liquid cooling or air-based convection cooling built into the equipment will remove the need for energy-intensive air conditioning units, streamlining and simplifying connectivity sites, reducing their footprint, and requiring fewer service visits.

The Ericsson Power Supply Unit minimizes power loss by 50%, and with Maximum Power Point Track, the voltage loss between solar power cells and batteries can be eliminated. With Voltage Booster, current equipment can be used longer, saving resources by prolonging the life cycle.

Up to
5%
Energy savings

7%
In battery efficency

20%
savings in cable losses

30-100%
Energy savings with renewables

Energy measurement ECO mode

98% efficiency Li-Ion

98% efficiency UHE PSU

DC to DC Voltage Booster saves on cable losses

Smart use of batteries in cell sites

Li-ion batteries installed at smart connected sites can be charged when electricity prices are at their lowest or when renewable energy production is at its highest. When compared to traditional lead acid batteries, li-ion batteries have a 10% higher charging efficiency and a 20 times longer life cycle, and when using connected batteries, it's possible for providers to monitor battery health and charge levels remotely.

When prices peak, availability goes down, or if the grid is flooded with power from non-renewable sources, stored energy from these batteries can be seamlessly released to power the site at the lowest possible price—allowing service providers to maintain cost-effective connectivity, cut emissions, and reduce the load on the power grid. Batteries are a common emergency backup solution, but when used in this way, they become a core part of a site's energy infrastructure. An integrated energy management solution will be key to managing this in a simple way.

Quantifiable benefits

Site energy management means reduced costs for service providers. With rising energy costs, the ability to store cheap electricity and use it when prices peak leads to significant savings.

A normal 5G site with a typical load of 5kW could reduce its electricity bill by 8% simply by using energy storage and energy management solutions that optimize

Intelligent energy management optimizes supply and demand this mobile site.

electricity use. This reduction could lead to a saving of around $500 per year and per site. When combined with more energy-efficient radios, network equipment, and power-saving software solutions, cost can be cut even further.

Introducing renewable energy sources

Mitigating the impact of peaks and storing energy reduces costs—but with the full extent of energy solutions available, connectivity service providers can further decrease their energy costs and increase their network resilience. The solution is to generate electricity on-site rather than relying solely on the grid, batteries, or generators. Solar panels or wind turbines used in conjunction with other energy solutions can provide a significant share of

the site's total energy.

Deutsche Telekom runs one such site in Dittenheim, Germany. Their solution shields them from the worst price peaks and helps maintain resilience at this rural site. With the help of Ericsson's hardware and software solutions, Deutsche Telekom became the first service provider in the world to implement a unified solution using a single management system for core, transport, radio access network (RAN), and hybrid power management, including renewable power sources at a commercial 5G mobile broadband site.

At the site in Dittenheim, the combination of solar and wind stood for 17% of the site's total yearly energy needs, rising to 50% and even increasing to 100% during periods of optimal weather.

Shelter indoor sites		
40 000 kWh	typical site consumption/yr	
22 tons	estimated CO2e site/yr	
>600 Kgs	sheet metal ++	
5 m²	reference shelter area	

Outdoor enclosure sites	
-10 000 kWh	reduction due to outdoor evolution
-5 tons	reduced CO2e site/yr
-300 Kgs	in steel, copper + materials
-2,5 m²	typical 2 x enclosure site

Zero Footprint sites	
-13 000 kWh	cut due to fanless power design
-8 tons	reduced CO2e site/yr
-550 Kgs	in build weight — steel + copper
0 m²	ground footprint need

Ericsson's energy generation and hybrid management offering

The Ericsson Smart Connected Site solution offers an intelligent and unified way to digitalize the site, enabling remote control and monitoring of all site equipment. Visualizations on network, site and cabinet levels can be provided to customers and are accessible from the NOC or field devices.

The Smart Connected Site combines various measurements and alarms from passive infrastructure with the active (radio, baseband and transport) data into a unified management tool: the Ericsson Network Manager (ENM). This enables automated data collection and site data analysis to help service providers manage their networks more efficiently through real-time insights and control.

The Ericsson Smart Connected Site enables visibility and intelligence. The power system interfaces with solar panels, wind turbines, grids, batteries and other sources of energy, such as fuel cells and generators, intelligently managing all the energy sources in a hybrid environment.

A smart solar hybrid site allows autonomous and resilient energy usage.

Service providers can let solar and wind provide a greater share of the total energy needs on a clear, windy summer's day, while on a dark, still day in winter, power from the grid or the battery can be utilized effectively. And at times of high energy prices or power disruptions, the battery can step in to maintain normal performance.

Batteries enable hybrid energy management

Through hybrid management of the solar and wind energy generated at the site, the optimal energy source is always used. The site can automatically switch between grid, energy storage, and renewables, thus reducing overall consumption. The role of batteries in smart sites is critical. With proper dimensioning and orchestrated network-wide operation, battery systems become enablers for different smart site solutions, while also reducing energy consumption and CO_2 emissions.

Further reduction in emissions can be achieved through remote management of diesel generators. By running them in their optimal working range, fuel consumption can be reduced by up to 40%, while simultaneously reducing maintenance and extending the generator's lifetime. When used together with on-site batteries, their active running time can be extended even further.
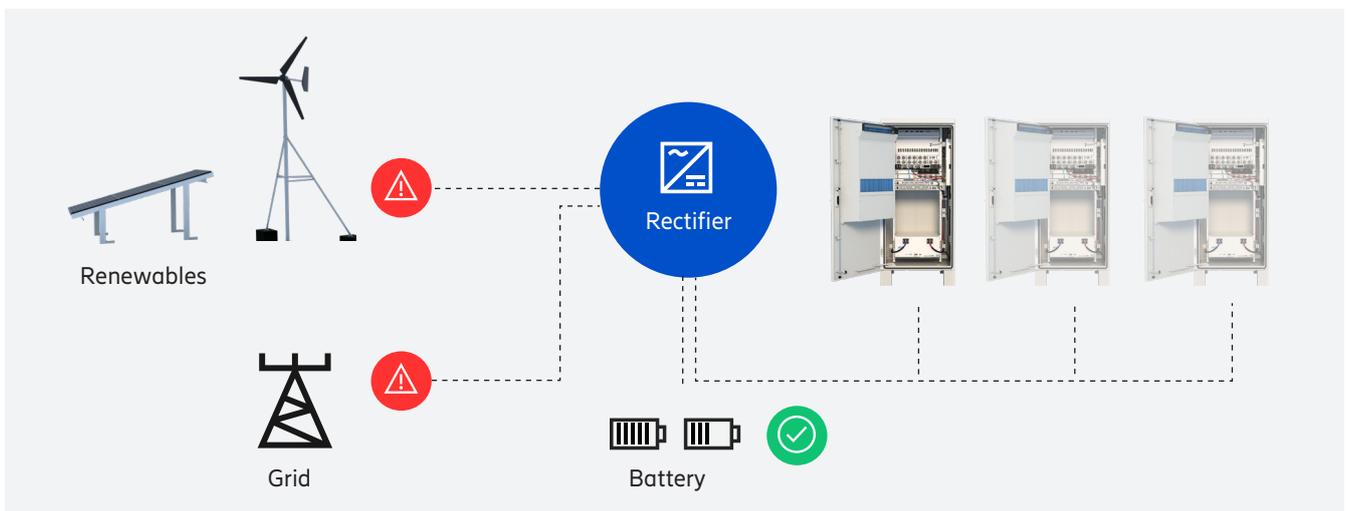
Intelligent – Smart Connected Site

The combination of RAN and site-collected data enables unprecedented opportunities through industry-leading automation techniques. Real-time control of assets, intelligent actionable insights, smart energy management and predictive data control significantly improve efficiency and reduce costs. Machine learning applications and automation software use input from on-site sensors in energy saving and control features like peak energy control, battery health and policy management. Additionally, predictive control features can use information like battery performance data to identify the best time for battery replacement.

Peak energy control
Peak energy control makes it possible to run the site with power from the grid or a generator, with the battery stepping during peaks that go beyond what these energy sources can provide.

Peak load shifting time
Energy storage provides energy during high-demand periods, giving the same capacity as during periods of lower demand.

The energy mix that keeps the site running can be managed and optimized by the service provider, allowing them to switch to the most valuable and cost-effective energy source for the longest possible time as needed.

Controllers for the dual power sources and batteries are connected via hardware to the Ericsson Network Manager, where the service provider has full visibility and control.

Policy-based energy management
In the event of a power failure, service providers can extend the site's uptime with policy-based energy management. By managing sectors and battery time, they can prioritize power supply, thus keeping the site running until grid power is back.
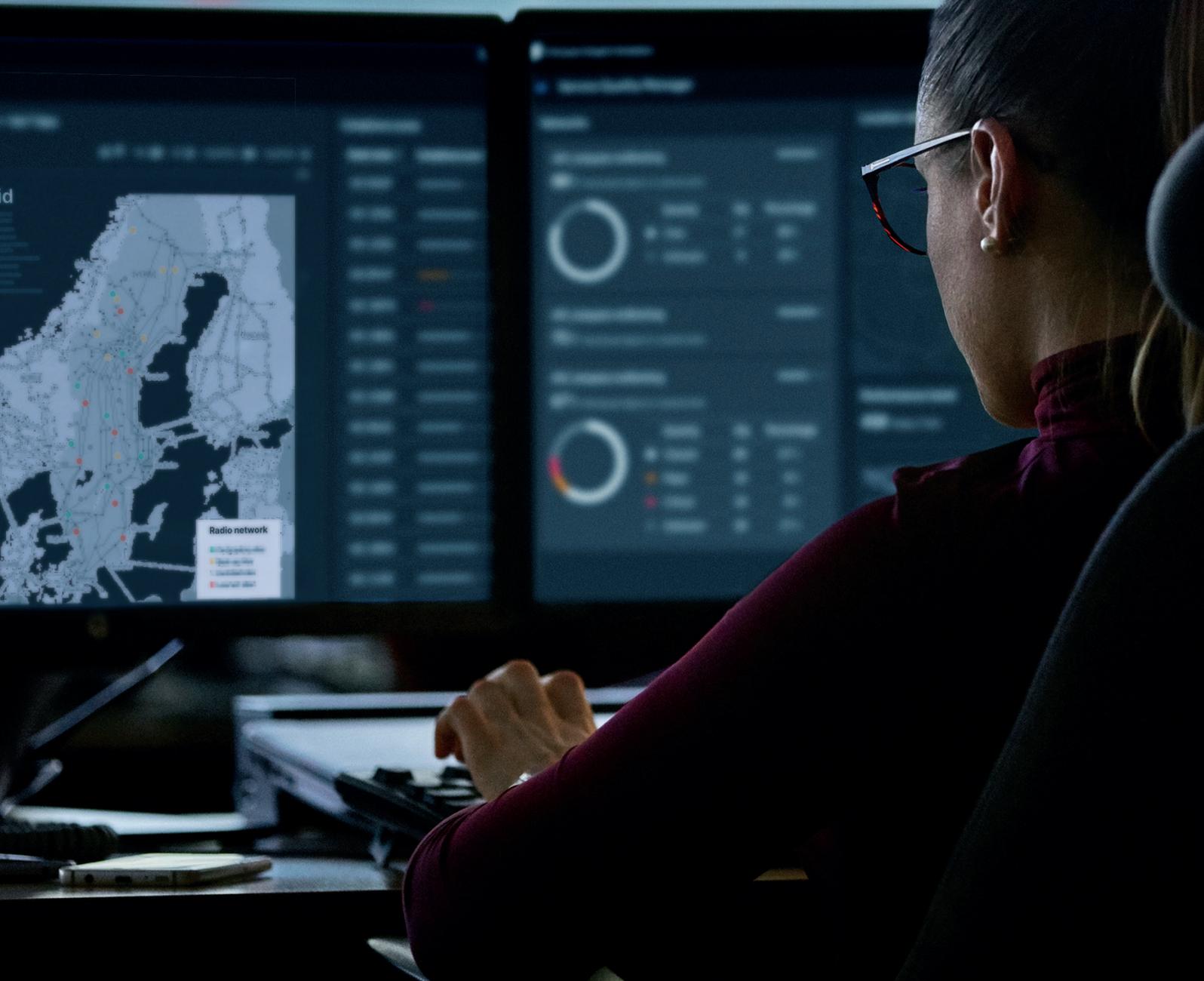
Visibility
— Smart connected site

Network Manager
(ENM)

Environmental
metering

Precision
climate control

Remote-controlled
rectifiers

Smart locking
system

Smart connected
batteries

Smart distribution: DC up
conversion/AC inverter

Smart controller for
asset management and
secure access to Ericsson
Network Manager

Energy
metering

Interface for sensors
and surveillance
equipment

With the Smart Connected Site solution, data is collected across the site to give the service provider a unified overview of its current performance. When this information is gathered in the Ericsson Network Manager, together with feeds from on-site cameras and environmental sensors, the service provider gets complete insights into the situation at the site. Regardless of where they are, the system gives them answers to critical questions about the network and reduces the need for manual intervention. The site provides uninterrupted resilient network performance with a high level of independence from fossil fuels, volatile energy costs, and service visits.

This solution gives service-providers more intelligent site management, as it includes 24/7 information about availability, capacity, network performance and site energy management, along with unprecedented control over network stability.

Ericsson Site Energy Orchestration — gain new revenue streams
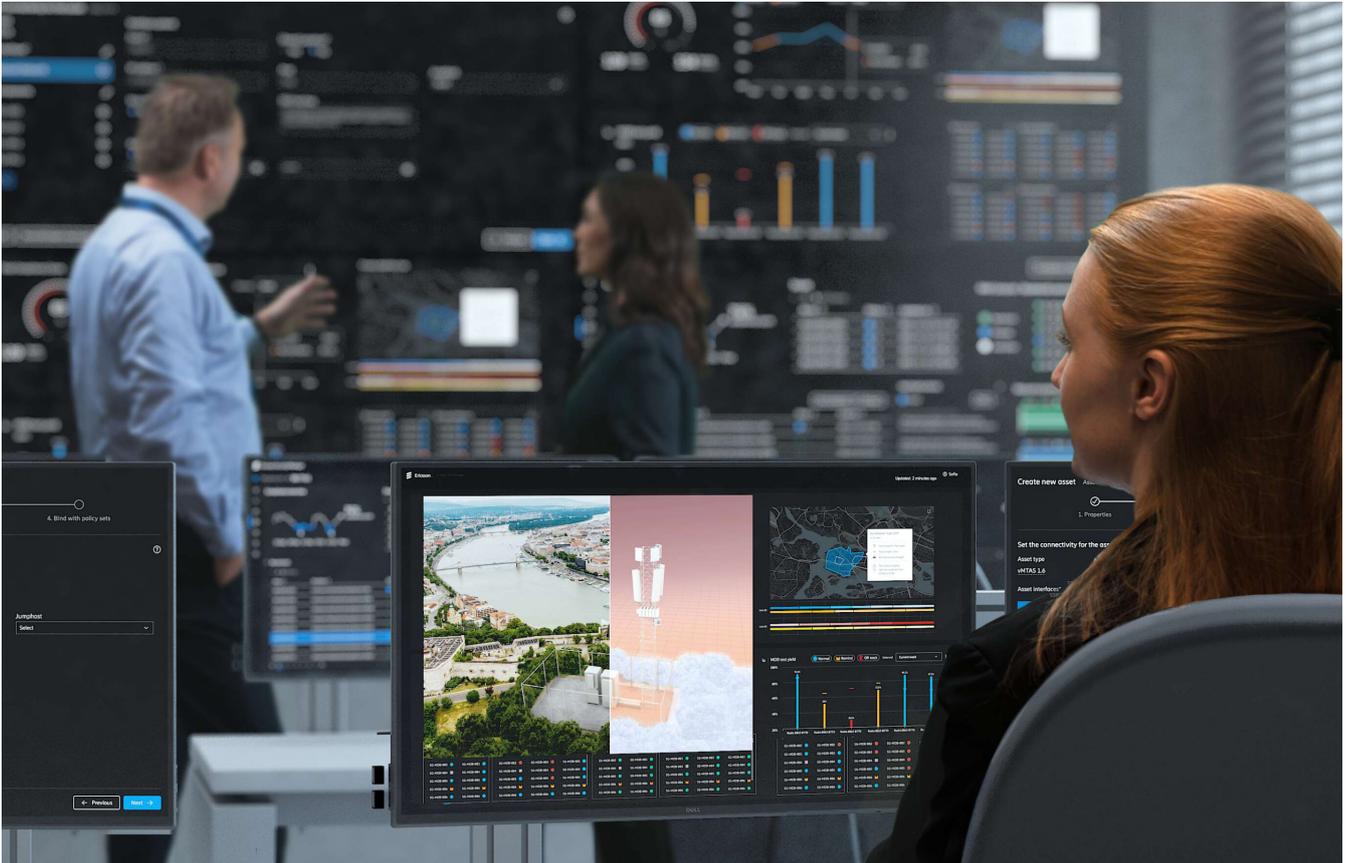
AI, policy-based energy management and smart connected sites give the service provider full control remotely via a single platform.

Once site energy management is established, the next step is to aggregate several sites in a cluster. The Site Energy Orchestration solution uses AI to calculate the cluster's capabilities and depending on the level of deregulation in the specific market, select which energy ancillary services to address and decide how to combine them with other OPEX reduction features.

The Site Energy Orchestration solution will also interact with weather information and energy price level agreements, as well as with energy providers and the energy spot market.

Another way of using the Site Energy Orchestration solution is to generate electricity on-site rather than relying solely on the grid, batteries, or generators. Solar panels or wind turbines used in conjunction with other energy solutions can provide a significant share of the site's total energy.

Such a solution could turn service providers from consumers of electricity to producers in the renewable energy net. When grid power is deemed the best energy alternative by the energy management system, the excess power generated on-site can be sold to the grid, generating income for the service provider. With a setup like this, service providers become trusted suppliers of vital connectivity and generators of renewable energy that can benefit society further.

A more resilient network with one unified management system
All in all, the Ericsson Network Manager reduces operational expenses and maximizes output. Costs can be reduced across the board—from the sites' electricity costs to the costs of operations and maintenance. AI, policy-based energy management and smart connected sites give the service provider full control remotely via a single platform. This creates a more resilient network with greater uptime and less exposure to external factors.

About Ericsson

Ericsson enables communications service providers and enterprises to capture the full value of connectivity. The company's portfolio spans the following business areas: Networks, Cloud Software and Services, Enterprise Wireless Solutions, Global Communications Platform, and Technologies and New Businesses. It is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's innovation investments have delivered the benefits of mobility and mobile broadband to billions of people globally. Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York.

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