

Case study

Realizing sustainable 5G-enabled smart manufacturing in the US

Ericsson USA 5G Smart Factory



ERICSSON

Climate action through technology and innovation

Case study:
Ericsson

Industry:
High tech manufacturing

Executive summary

Climate change is one of the biggest challenges facing humanity today. To avoid the worst impacts of climate change, global greenhouse gas emissions need to be reduced by 50 percent between 2020 and 2030, and by another 50 percent each decade thereafter to reach net zero carbon by 2050.

Ericsson has set a carbon neutral target for its own operations by 2030. The Ericsson USA 5G Smart Factory in Lewisville, Texas integrates sustainability

in all aspects of its building design, construction and operations and is certified LEED Gold®. Ericsson is now pursuing LEED Zero Carbon Certification for the 5G smart factory.

This case study examines the challenges faced by the project and the unique, innovative solutions that created a highly automated, sustainable and connected smart factory that aligns with Ericsson's commitment to sustainable development and climate action.

At-a-glance

Goal:

An automated, connected and sustainable smart factory that aligns with Ericsson's commitment to sustainability and climate action

Approach:

- Integrate sustainability in building design, construction and operations.

Improvements:

- up to 24 percent more energy-efficient than a comparable building
- use 75 percent less indoor water than a comparable building
- 40,000-gallon tanks to capture and reuse rainwater
- 17 percent of power need produced by on-site solar panels
- 100 percent renewable power procured from grid

Global trends

Climate action through technology and innovation

The Information and Communications Technology (ICT) sector can play a significant role in responding to climate change. "ICT represents only about 1.4 percent of total carbon emissions right now, but we as an industry have an opportunity to impact at least 15 percent of that total CO2 footprint by 2030," said Niklas Heuvelodop, President and CEO, Ericsson North America. "Where does it begin? We start with ourselves, with Ericsson."

Ericsson has set a goal to become carbon neutral for company operations by 2030. This means carbon emissions from Ericsson's fleet vehicles and energy usage from our facilities across the globe will be net zero by 2030.

Ericsson is an active partner with leading organizations in developing the Exponential Roadmap, which outlines 36 existing solutions across all sectors of the economy

that can be scaled to help reduce global greenhouse gas emissions by 50 percent by 2030.

Bringing sustainable 5G-enabled smart manufacturing to the US

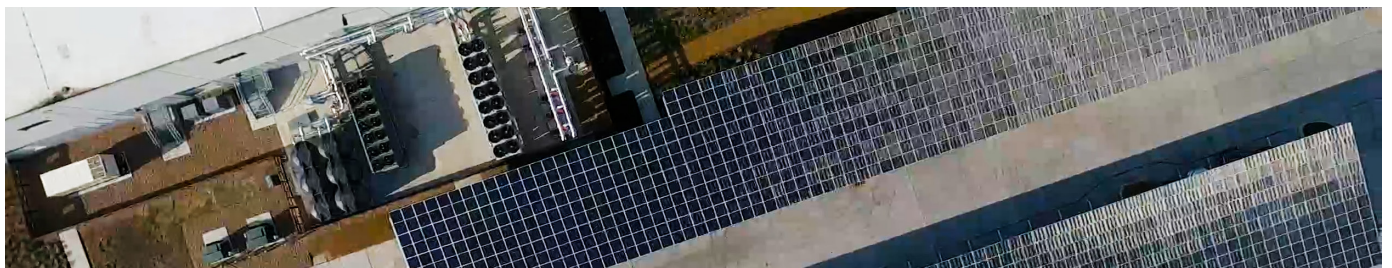
The Ericsson USA 5G Smart Factory located in Lewisville, Texas is achieving many firsts. It's Ericsson's first highly automated smart factory in the United States, producing 5G and Advanced Antenna System (AAS) radios to accelerate 5G deployments in North America. And it will be the first Ericsson factory globally to achieve both LEED Gold and LEED Zero Carbon certifications.

Manufacturing accounts for 32 percent of the global greenhouse gas (GHG) emissions.¹ The smart factory is an example of how innovation can help the manufacturing sector transition towards a low-carbon future while meeting business objectives.

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—Niklas Heuvelodop
President and CEO, Ericsson North America

1. https://exponentialroadmap.org/wp-content/uploads/2019/09/ExponentialRoadmap_1.5_20190919_Single-Pages.pdf



1,646 solar modules producing over 1,000 MWh annually

The challenge

With the Ericsson USA 5G Smart Factory, Ericsson resolved to:

- introduce state-of-the-art, high-volume manufacturing of 5G networking equipment in line with our commitment to the US market
 - bring telecom equipment manufacturing to the United States
 - create supply chain resiliency
- All while meeting Ericsson's sustainability goals and objectives.

Maximizing efficiency and productivity; minimizing climate impact

Ericsson chose to pursue LEED (Leadership in Energy and Environmental Design) certification because LEED is the most prominent green building rating system in the world.

LEED Gold certification provides independent verification of a building's sustainability features, allowing for the design, construction, operation and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings. Simultaneously, Ericsson is pursuing LEED Zero Carbon certification, which recognizes buildings operating with net-zero carbon emissions over the course of a year. This certification requires that the balance of carbon caused from facility energy consumption and occupant transportation be less than carbon emissions avoided or offset. These goals are integral to the smart factory's operations and our business objectives.

Integrating sustainability into the smart factory

At 300,000 square feet—the equivalent of five American football fields—the Ericsson USA 5G Smart Factory covers a lot of ground. The structure was originally built as a fulfillment center, not a leading-edge, energy-efficient, water-conserving, sustainable, highly automated smart factory.

Manufacturing state-of-the-art 5G equipment requires a precisely controlled environment inside the building. Outside the building, the project had to account for the region's hot summers and chilly winters. To overcome these challenges and meet the ambitious objectives, the team would draw on Ericsson's culture of collaboration, quick execution and fact-based decision making.

They said it couldn't be done. Ericsson proved it can.

When Ericsson's objectives were shared with the project team, they said the plans were too ambitious. Office and residential buildings have achieved LEED certification, but a manufacturing facility producing telecom equipment at high volume? Once it was clear that Ericsson was committed and confident of success, the project teams brought all their resources to make it happen.

"It's not easy to turn a tilt-up concrete warehouse building into a high-performance electronics factory, but Ericsson's passion was infectious, and it motivated everyone," said Gail Napell, Project Architect LEED AP BD+C, Senior Associate, Gensler. "The team left no stone unturned to drive down the energy and water use while creating a clean-room-level factory and provide the best possible occupant experience. Client inspiration, common goal, and also Ericsson's constant documenting and sharing of the successes, made this one of the most enjoyable challenging projects I've worked on in my career."

The solution

Making the impossible possible

Ericsson and the project team considered every possible technology, from bifacial solar panels, fuel cells, to a geothermal system for cooling and micro-grid. They found advanced and highly creative solutions that would meet environmental and financial objectives.

Water conservation

Ericsson installed 40,000-gallon water tanks to collect, treat and use rainwater at the factory—enough to meet the needs of an average American family for 130 days. Used along with high-efficiency plumbing fixtures, this system is designed to enable the factory to use 75 percent less water for indoor use than a comparable building.

Energy use reduction

Ericsson invested in high-efficiency mechanical and electrical systems that will enable the factory to operate with 24 percent less energy use than comparable buildings while significantly reducing carbon emissions.



Why is LEED certification significant?

LEED (Leadership in Energy and Environmental Design)* is the most widely used, independent green-building rating system in the world and a globally recognized symbol of sustainability leadership. LEED provides a framework for creating healthy, high-performing, resource-efficient and cost-saving buildings.



40,000-gallon water tanks collect, treat and use rainwater at the factory

75%

indoor water usage reduction

17%

of building power through on-site solar

24%

less energy used

100%

sourced renewable power

*The LEED® certification trademark is owned by the U.S. Green Building Council® and is used with permission.



5G smart factory manufacturing

Renewable energy sources

After extensive research and consultation with the project team and city officials to determine the maximum solar coverage possible on the factory property, Ericsson installed a ground-mounted system with 1,646 solar modules, primarily over parking spots, thus providing shade for vehicles while minimizing the impact on the surrounding landscape.

To maximize the on-site solar production, the solar panels use bifacial technology that captures solar radiation from above as well as radiation reflected off the ground, thereby maximizing power output with a limited footprint.

The solar system is designed to produce up to 1,030 megawatt hours annually—enough to provide renewable energy to about 93 US homes for a year. In addition, eight electric vehicle (EV) charging stations are available in the car parks at no cost to employees, encouraging the use of electric vehicles.

The on-site solar panels, combined with grid-procured certified renewable power, meet 100 percent of the smart factory's power requirements.

High-efficiency HVAC (Heating Ventilation and Air Conditioning) system

About 35 percent of a building's total energy consumption comes from heating, ventilation and air conditioning.² Controlling temperature and humidity is critical when manufacturing telecommunications equipment to exacting standards.

Ericsson considered every possible energy-efficiency technology, including a geothermal system, for cooling and micro-grid applications to meet these requirements and drive energy use reduction. The solution? A combination of magnetic levitation chiller and thermal energy storage banks.

Six thermal energy storage tanks, each holding approximately 10,000 gallons of water, are paired with an extremely efficient, oil-free, friction-free magnetic levitation

chiller that uses a next-generation refrigerant with very low global-warming and ozone-depletion potential.

At night, when there is less demand on the power grid, the chiller freezes the water, storing thermal energy in the form of ice in these tanks. During the day, when demand on the power grid rises and the power costs are high, the building controls system will start melting this ice to provide cooling for the smart factory. This helps reduce total energy cost, lower the demand on the power grid during the day and helps support the stability of the Texas utility grid.

All told, the building's cooling system is 1.5 times more efficient than the industry requirement. The ice banks are able to independently cool the entire building for about three hours during a peak summer day.

Smart management for a smart building

Within the building, highly intelligent energy management and environmental monitoring systems keep temperature and humidity at optimal levels for both people and machines. In addition, the factory creates a safe and healthy work environment by incorporating MERV 13 air filtration (filtering 90 percent of air particles in the 3-10µm range) and reducing airborne contaminants.

Sustainable resources and materials

To reduce waste and the environmental impact of the construction, Ericsson selected raw materials with verified positive life-cycle impacts and diverted more than 98 percent of construction debris from the landfill. These construction materials, including wiring, metal, concrete, wood and windows, are being salvaged for reuse in other projects or as landscaping materials.

Digital connectivity—a key enabler

Digitalization transforms all industries, increasing energy and material efficiencies and reducing carbon emissions. By utilizing next-generation digital technologies such



Reduced demand for cooling



Optimized humidity and temperature

98%

of construction materials recycled or reused

"I am proud of Ericsson's commitment to innovating technology for good. By investing in sustainable technologies in pursuit of LEED Gold and Zero Carbon certification for the USA 5G Smart Factory, Ericsson is demonstrating how whole industries can transform and drive towards a net-zero carbon future."

—Erik Simonsson
Head of the Ericsson USA 5G Smart Factory

as 5G, IoT, AI and machine learning, the Ericsson USA 5G Smart Factory implements innovative ICT solutions to increase production efficiency, reduce resource consumption and adopt renewables to show how manufacturing can transition to a low-carbon future while meeting key business objectives.

2. <https://www.energy.gov/sites/prod/files/2017/03/f34/qtr-2015-chapter5.pdf>

What else is Ericsson doing?

Ericsson is taking extraordinary steps to achieve not only LEED Gold but also LEED Carbon Zero certification. The factory is using the above-mentioned high-efficiency mechanical systems to reduce energy consumption and produce as much renewable energy on-site as possible. In addition, Ericsson sources Green-e certified renewable power from the grid and will be purchasing carbon offsets for emissions from natural gas usage and for transportation used by Ericsson employees to get to the factory. The factory is expected to reach a carbon balance of zero or less within a year of achieving LEED Gold certification.

The painstaking attention to sustainability and the environment also makes the smart factory a good neighbor to our partners in

Lewisville and Texas. The state of Texas is prone to drought conditions and high summer temperatures that can push the power grid to the limit. The low-water-usage, highly efficient renewable-energy-powered facility—including charging stations for electric vehicles (EVs)—is perfectly aligned with the city of Lewisville’s own “Big Move: Sustainability 2025” plan.³ Their partnership was invaluable in helping Ericsson develop and execute their design for the factory.

With an array of innovative and unique sustainable solutions inside and out, the Ericsson USA 5G Smart Factory is a major leap towards fulfilling Ericsson’s commitment to environmental sustainability and to becoming carbon neutral for company operations by 2030.

Projected impacts

Innovating technology for good and creating positive change

Powered by Ericsson’s 5G solution tailored for the industrial environment, the Ericsson USA 5G Smart Factory:

- introduces state-of-the-art, high-volume manufacturing to meet the demand for 5G deployments
- brings telecom equipment manufacturing capability to the United States
- ensures supply chain resiliency
- meets Ericsson’s sustainability goals and objectives

Key use cases enabling sustainable development

Digital material tracking
Using ultra-wideband technology provides more precise location services, and current location, status and condition of critical and high-value assets can be tracked over time. This real-time tracking of critical assets increases productivity and eliminates waste and rework.

Expected impact:

- 10 percent increase in repair technician productivity

Energy and environmental monitoring
Using energy sensors to track power consumption and environmental sensors, connected over 4G, to track temperature and humidity provides real-time visibility to control production clean room and optimize energy consumption in the factory.

Expected impact:

- 5 percent reduction in energy consumption
- 5 percent reduction in rework and scraping of production components

Smart irrigation
Thumb-sized irrigation sensors with long battery lives send temperature, humidity and water proximity data over 4G. This real-time data-tracking capability of soil conditions helps to identify water leakage and optimize irrigation cycles, thereby reducing water consumption.

Expected impact:

- 5 percent reduction in water leakage and consumption

Positively contributing to UN Sustainable Development Goals



3. <https://www.cityoflewisville.com/doing-business/lewisville-2025/big-move-9-sustainability>

About Ericsson

Ericsson enables communications service providers to capture the full value of connectivity. The company's portfolio spans Networks, Digital Services, Managed Services, and Emerging Business and is designed to help our customers go digital, increase efficiency and find new revenue streams. Ericsson's investments in innovation have delivered the benefits of telephony and mobile broadband to billions of people around the world. The Ericsson stock is listed on Nasdaq Stockholm and on Nasdaq New York. www.ericsson.com

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