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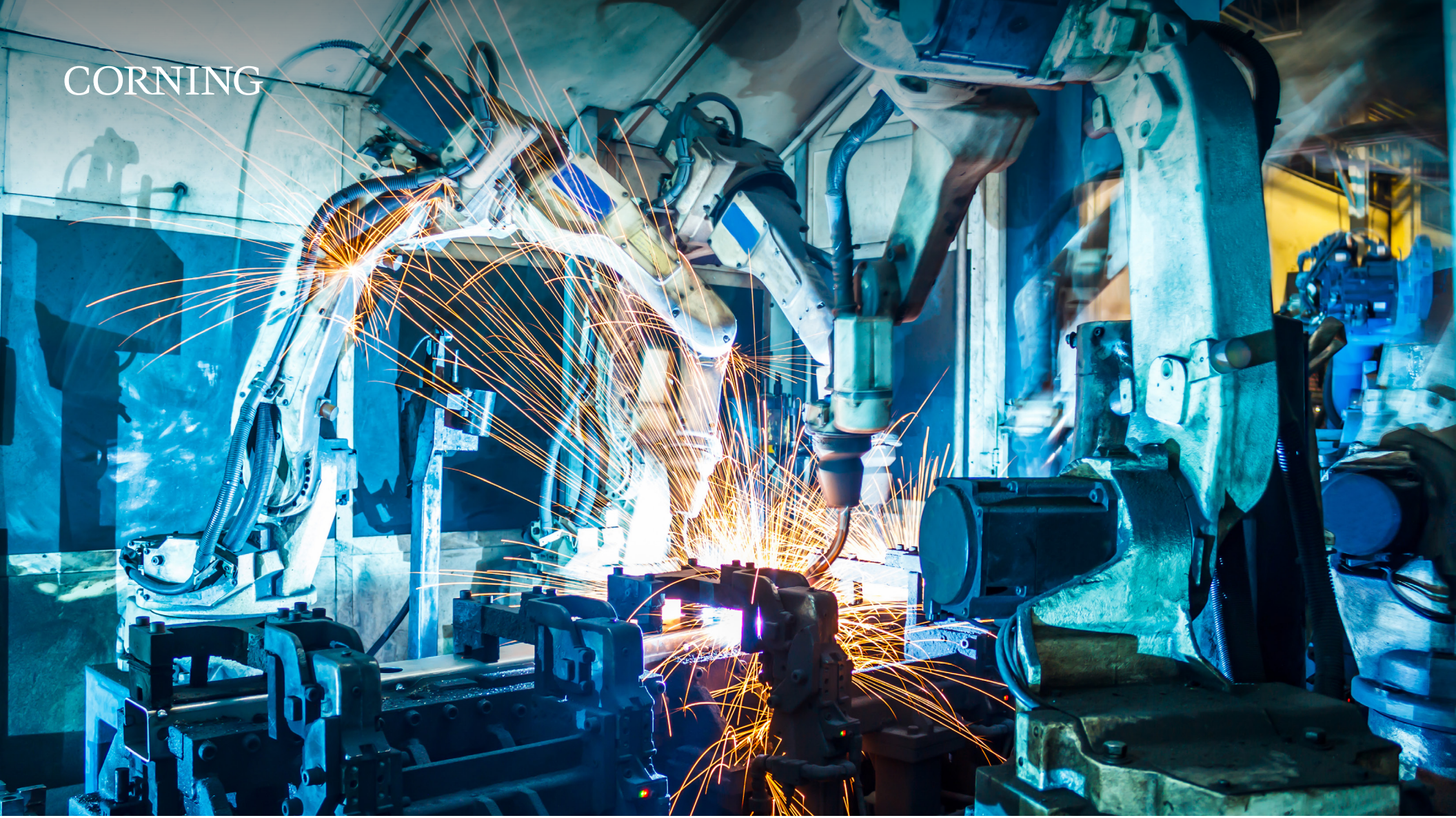


The Future Runs on Fiber

Building Industrial Infrastructure for Tomorrow's Demands

Manufacturing is Undergoing its Most Significant Transformation in Decades

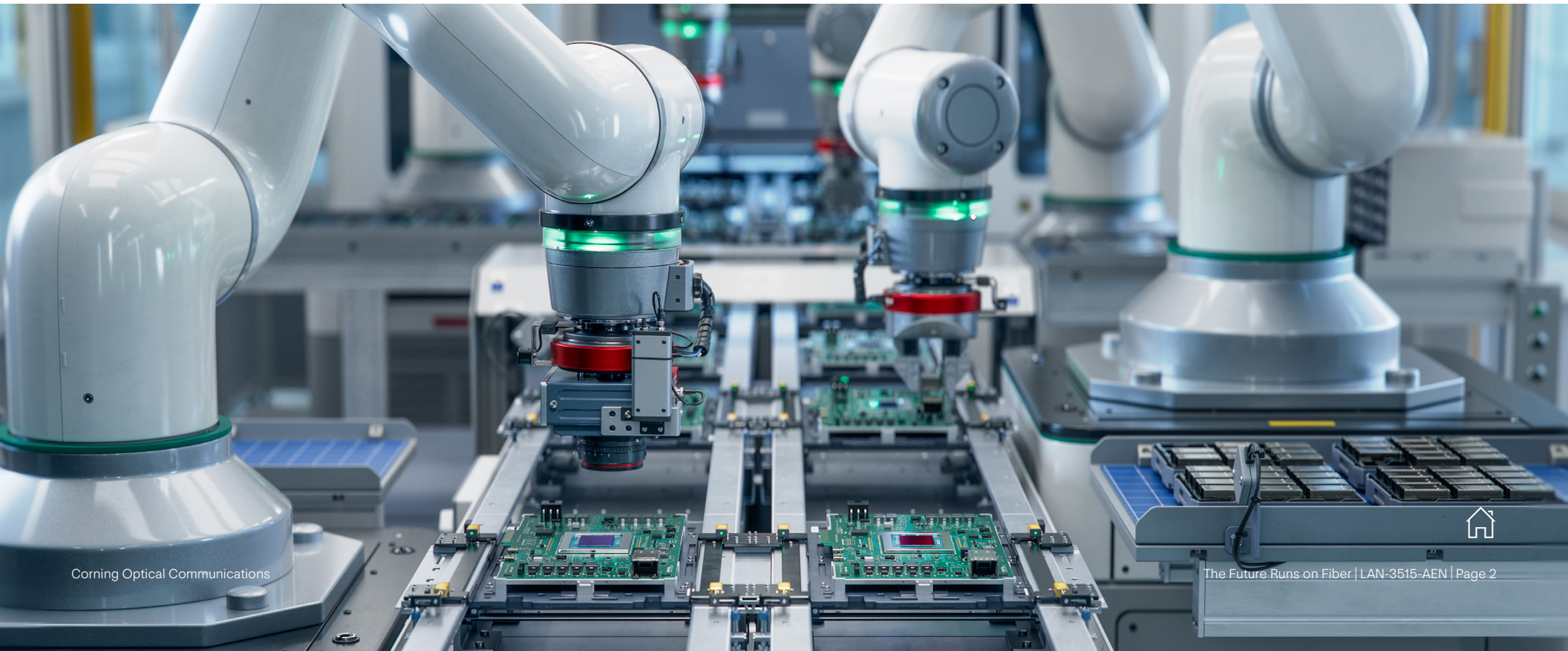
As industries embrace another digital revolution, billions are being invested[1] in artificial intelligence (AI), machine learning (ML), and cloud computing to optimize production and drive smarter decision-making.

But there's a fundamental challenge: **today's physical infrastructure wasn't built for tomorrow's digital future.**

From semiconductor and EV battery manufacturing to pharmaceutical and oil & gas plants, AI-enhanced processes have shifted from a competitive advantage to a competitive necessity.

Modern smart manufacturing requires seamless connectivity between machines and humans, allowing for real-time data collection and analysis. Legacy infrastructure simply wasn't designed for this scale.

[1]The Zayo Bandwidth Report: Key Trends Driving the Bandwidth Boom (2024)



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The Smart Manufacturing Revolution

A State-of-the-Industry

Manufacturing infrastructure demands have reached a critical inflection point where legacy systems can no longer support the scale and speed modern operations require.

The Scale of This Revolution is Staggering

Bandwidth demands in manufacturing have reached unprecedented levels. Manufacturers aren't just coping with increased challenges; they are rapidly scaling their network capacity to meet them. According to the Zayo Bandwidth Report[2], the manufacturing sector saw a 364% increase in wavelength capacity purchased between 2020 and 2024. Dozens of new facilities are under construction, AI is shifting from advantage to necessity, and infrastructure demands are surging while installation capacity remains limited.

Two Factors are Creating This Gap

1 Market Forces Driving Change

Manufacturing reshoring is creating unprecedented infrastructure demands. Government programs and private investment are driving massive industrial buildout, spurring the construction of new high-tech facilities designed for precision production.

AI is transforming manufacturing operations. Through predictive analytics and real-time decision-making, AI allows equipment parameters to be adjusted automatically, enabling smarter, faster production with fewer interruptions.

2 Operational Impacts Requiring New Solutions

The skilled labor shortage is acute. There simply aren't enough qualified technicians to build and maintain the infrastructure these facilities require, particularly for fiber-intensive environments.

Automation is no longer optional. Manufacturing facilities are implementing enhanced automation to optimize production efficiency and worker safety, but this drives demand for high-performance network infrastructure that can support these capabilities.

Building Future-Ready Manufacturing Networks

The path to smart manufacturing isn't theoretical, it's being built right now. Manufacturing leaders face infrastructure realities that traditional network approaches weren't designed to solve. These realities break down into three categories: technical demands, implementation barriers, and environmental factors.

Technical Demands

Modern manufacturing often requires converging IT (information technology) and OT (operational technology) into a single backbone. This means connecting thousands of sensors and automated systems across facilities that can span hundreds of thousands of square feet, all while transmitting data with minimal latency.

Copper networks, designed around 300-foot segments and equipment closets every few hundred feet, simply cannot deliver the reach or bandwidth required. In smart manufacturing, network failures cascade through interconnected systems and downtime costs are exponentially higher than in traditional manufacturing.

Implementation Barriers

Challenge	What It Means
IT/OT Integration	Teams with different objectives and systems need infrastructure that supports convergence
Edge vs. Cloud Flexibility	Networks must support both on-premise edge computing and cloud connectivity as strategies evolve
Info goes here	Demand for skilled network installers is high, making deployment speed and simplicity increasingly important
Advanced Automation	Enhanced manufacturing processes require high-performance network infrastructure as a foundation

Environmental Factors

The physical challenges of industrial environments compound these demands and implementation barriers, and they vary significantly by sector.

Manufacturing

Modern facilities present unique infrastructure challenges: clean rooms requiring contamination-free installations, zone architectures spanning vast distances, and areas with limited access for maintenance. These environments demand robust solutions that can operate reliably without frequent intervention.

Energy

Aging infrastructure meets urgent modernization needs. Energy facilities operate under extreme conditions such as high temperatures, vibration, and electromagnetic interference, while facing pressure to increase automation, improve efficiency, and adopt more sustainable practices. Pipeline monitoring and safety systems add further connectivity requirements across dispersed geographic areas.

Utilities

Critical systems requiring 24/7 monitoring face their own challenges: up to 85% of water treatment plants are at or near design capacity, water loss from aging infrastructure is severe, and new EPA regulations are forcing upgrades. These facilities need continuous, reliable connectivity for monitoring and control systems that cannot afford downtime.

Identifying a solution that meets all these requirements simultaneously requires infrastructure built for a new and different era of manufacturing.

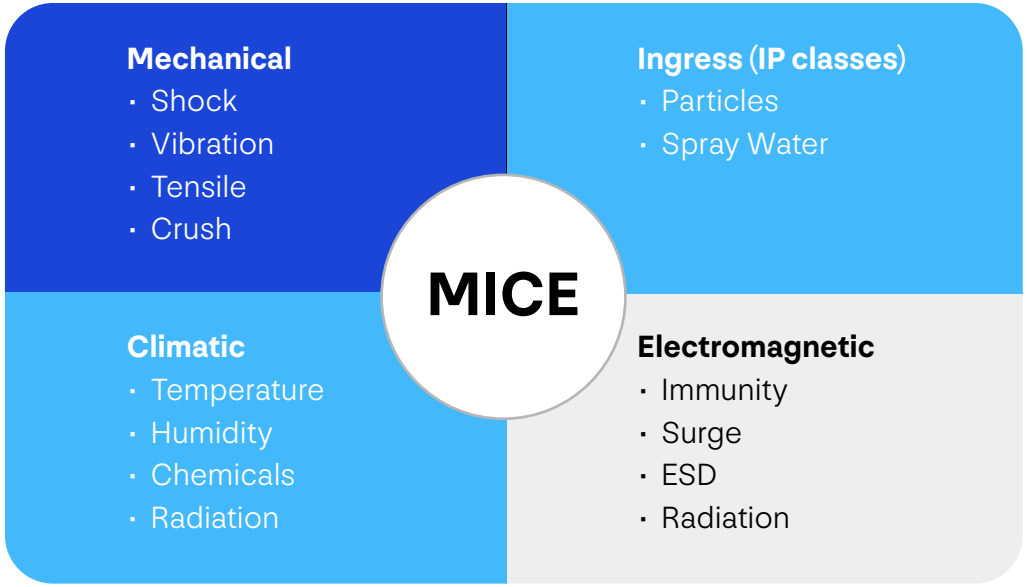
That solution is fiber optic technology.

2

Fast Forward

Leveraging Fiber to Meet the Demands of Today and Tomorrow

Four characteristics make fiber uniquely suited for smart manufacturing's demands.



Rating	Environmental Class		
	1	2	3
Mechanical	M_1	M_2	M_3
Ingress	I_1	I_2	I_3
Climate and chemical	C_1	C_2	C_3
Electromagnetic	E_1	E_2	E_3

Figure 1: An overview of ISO/IEC 11801/EN 50173/TIA-568 classification system for evaluating the environmental robustness of cabling systems and components in industrial settings. Source: Corning

1 Built for Industrial Reality

Fiber withstands the harsh conditions found in manufacturing facilities: extreme temperatures, chemical exposure, moisture, and vibration. Physical hazards like vibration can cause connectors to loosen, while moisture leads to corrosion. Electromagnetic interference can disrupt signal integrity. Unlike copper, fiber is immune to electromagnetic interference (EMI). Fiber optic solutions are engineered to meet or exceed MICE ratings, industrial standards that ensure cabling systems and components can withstand harsh environmental demands. Its rugged, dielectric design protects both network and personnel, eliminating risks from electrical shock, sparks, or fire. From clean rooms to industrial production floors, fiber performs reliably where traditional cabling struggles.

2 Performance That Scales

Fiber enables rapid, seamless data transfer crucial for real-time monitoring and control at smart factories. With virtually unlimited bandwidth and minimal latency, fiber networks support today's AI and machine learning demands while accommodating whatever new technology might be required down the line. Whether connecting thousands of sensors, running high-resolution cameras for quality control, or supporting AI-driven analytics, fiber delivers the performance modern manufacturing requires.

3 Sustainable & Cost Effective

Fiber is an important element of environmentally conscious design for the manufacturing sector. Unlike traditional copper cables that require frequent rip-and-replace upgrades as bandwidth demands grow, fiber backbone deployments are essentially “one and done”—allowing operations to scale without overhauling network infrastructure. Compared to copper, optical fiber delivers significant environmental advantages: up to 84% lower carbon footprint[3] and 54% lower power consumption[4] over the network’s lifespan. Because fiber doesn’t require equipment rooms throughout facilities, it eliminates the upgrade cycles and energy costs associated with cooling that equipment.

4 Deploy Faster, Maintain Less

Preterminated fiber assemblies are factory-sealed, tested, and ready to deploy out of the box. These ruggedized solutions enable faster, more reliable deployments with less specialized expertise—addressing harsh environments and labor shortages simultaneously. From a materials standpoint, facilities built with fiber backbones typically won’t need rewiring for decades, compared to the much more frequent rip-and-replace upgrades that copper-based networks require.

3 Sullivan et al. “A sustainable future with optical fiber.” White Paper, Corning Incorporated, March 2023.

4 Eurocable. (2022, Jul). Fibre: the most energy-efficient solution to Europe’s bandwidth needs.

Corning Optical Communications

Identifying a solution that meets all these requirements simultaneously requires infrastructure built for a new and different era of manufacturing. **That solution is fiber optic technology.**

These characteristics solve the infrastructure challenge. But solving it requires more than understanding fiber's advantages — it requires knowing how to implement them effectively.

3

Ready, Set, Scale

The Essentials of Designing with Fiber

With fiber's advantages established, the focus shifts to implementation: **how to deploy fiber infrastructure that maximizes operational benefits while simplifying deployment.**

Consider This Five Step Plan


Corning Optical Communications

1 **Enhance Network Integration and Deploy IIoT at Scale** Modern manufacturing benefits from improved connectivity between IT and OT systems, enabling better data sharing between machine control and analytics platforms. Embedded sensor arrays throughout facilities support process automation and operations optimization, opening the door to more sophisticated manufacturing capabilities. At scale, this enables real-time visibility, eliminates unplanned downtime, and unlocks advanced capabilities like inventory control and digital twins—allowing manufacturers to test and refine operations without disrupting physical production.

2 **Partner with Proven Fiber Optic Infrastructure Experts** Successful fiber deployment requires more than selecting the right technology, it demands partnering with manufacturers who have deep expertise in harsh environment applications, a comprehensive product portfolio, and the distribution network to support projects at scale. Look for partners with ruggedized solutions designed specifically for industrial settings and a track record of supporting manufacturing deployment.

Consider This Five Step Plan

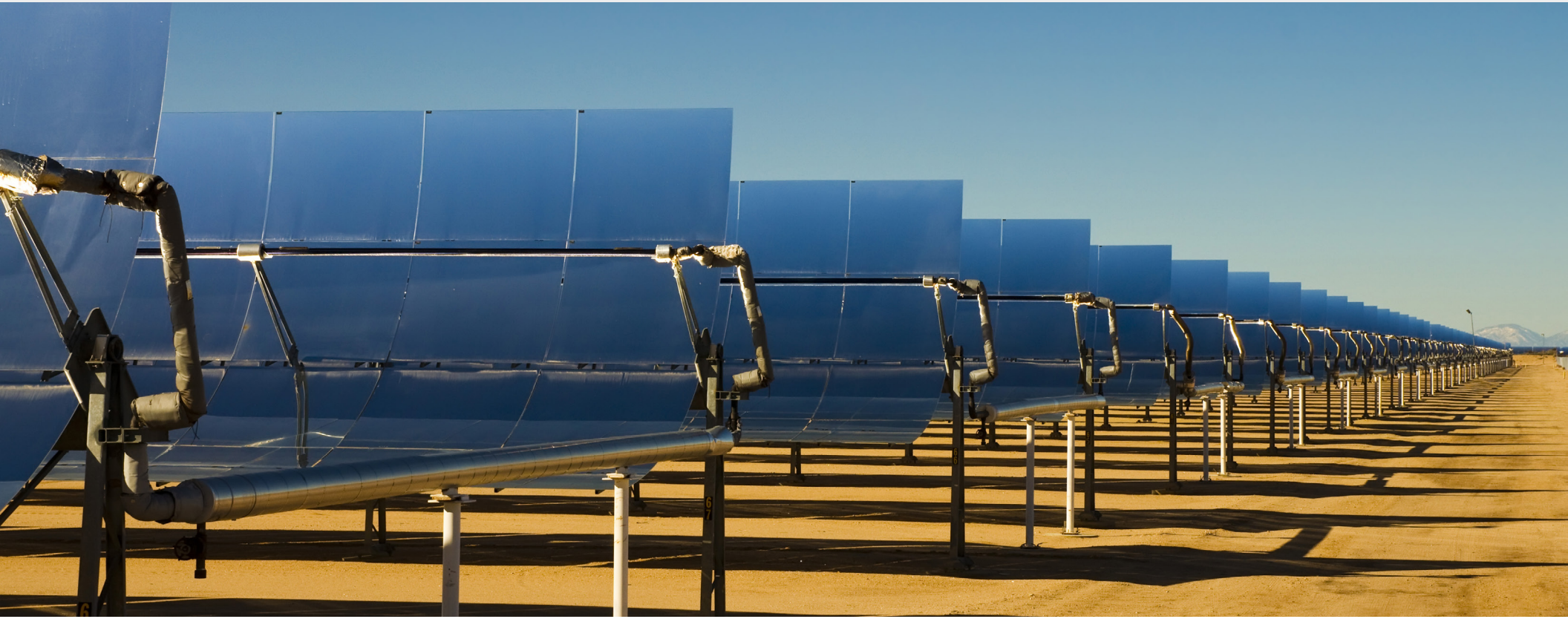
3 Deploy Preterminated Solutions

Preterminated fiber assemblies enable faster, more reliable deployments with less specialized expertise while addressing harsh environments and labor shortages. Ruggedized preterminated fiber solutions are factory-terminated, sealed, and tested cable assemblies ready to deploy out of the box. These systems are highly adaptable, offering a range of configurations from partial pre-terminated assemblies to fully plug-and-play solutions.

4 Consider Fiber-to-the-Edge (FTTE) Design

A long-reach network eliminates many of the pain points of conventional network design. Fiber allows for the long, uninterrupted wiring spans required by large buildings such as manufacturing facilities. The long-reach aspect of fiber also enables more far-flung devices.

Consider This Five Step Plan



5 Select Industrial-Grade LAN Components

Manufacturing environments demand cabling and hardware designed to withstand harsh conditions. Select solutions with appropriate MICE ratings that match your facility's environmental demands—from industrial-grade and ruggedized cables for factory floors to specialized solutions for mining, petrochemical, or outdoor applications. Selecting the right industrial components ensures your network can withstand environmental stressors while supporting smart manufacturing demands for decades.

For over 50 years, Corning has been pioneering fiber optic solutions that connect the world.

Today, we apply that expertise to help you

build manufacturing infrastructure that is scalable, reliable, and cost-effective. We provide the tools, resources, and support you need to create a well-planned fiber optic backbone for your network.

Learn more about Corning's Fiber Solutions

The future of manufacturing runs on fiber. And the time to build that future is now.

Contact a Corning Expert

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