The Five Critical Minerals Under Pressure From AI

written by Tracy Hughes | November 27, 2026

Amazon can name the mine supplying its copper. In Japan, a crystal maker is budgeting up to ¥150 billion to meet demand for the lasers that link AI processors.

Mining investors learned to read an electric vehicle sales report for what it said about lithium. I read Microsoft's construction figures in much the same way. At its Fairwater AI campus in Mount Pleasant, Wisconsin, Microsoft Corporation (NASDAQ: MSFT) installed 120 miles of underground power cable and 72.6 miles of mechanical piping. What caught my eye was that Microsoft was already building identical facilities elsewhere in the United States. In June, Microsoft declared its first Wisconsin facility fully operational. For a cable maker reading those announcements, the word worth circling was "identical."

Then there is the matter of where to put the data. Microsoft says the storage equipment serving Fairwater would stretch the length of five football fields. The chips doing the calculations get most of the attention. Keeping them fed takes another set of machines to hold the data, power to run those machines and high-speed connections to move the data back and forth. A mining investor who counts only the chips misses a good deal of the purchase order.

The electric car gave investors a relatively neat calculation. Start with the number of vehicles, the size of the battery and its chemistry, and you can estimate how much lithium a manufacturer needs. In 2025, the world bought more than 20 million electric cars. AI has a longer shopping list and an equally telling set of numbers. The International Energy Agency

estimates that the worldwide stock of servers designed for accelerated computing has grown eighteenfold since 2020. Under stated policies, it expects data centres to use about 1,000 terawatt-hours of electricity in 2030, roughly double the 2025 level. Conventional cloud storage and streaming are part of that total. AI-optimised facilities account for about three-quarters of the projected increase.

Of the 24 materials on the Critical Minerals Institute's 2026 CMI Watchlist, five stand out to me for the pressure AI is already putting on supply. I rank **copper** first, followed by **silicon, indium, gallium and germanium**. I weighed how much material a new project requires, which purchases can be traced to AI and how quickly a second supplier could fill an order. Copper leads on tonnage. For the other four, the decisive question can be whether anyone else can deliver a wafer, a laser crystal or a batch of optical-grade material to the customer's specification.

1. Copper Orders Reach the Mine

Amazon Web Services can name the mine. Under a two-year agreement with Rio Tinto (NYSE: RIO), AWS will use copper from the Johnson Camp mine in Arizona in components for its U.S. data centres. Gunnison Copper Corp. (TSX: GCU) owns the mine, where Rio has deployed its Nuton copper-leaching technology. It is easy enough for a mining company to put a picture of a server rack in an investor presentation. Here the technology company can point back to the mine.

How much copper belongs on AI's bill depends on where you stop counting. At a November briefing in Perth, Dr. Mark Andrich of Critical Minerals Platform presented an estimate of 11,580 tonnes per gigawatt of installed computing capacity, excluding on-site generation, transmission and the grid connection. That

works out to roughly 1,160 tonnes for a 100-megawatt phase before the utility starts its work. In a study of 20 materials used in AI infrastructure, Macdonald Amoah and colleagues found that copper accounted for 83% of the material mass they modelled. Nearly two-thirds of that copper went into transmission and distribution. Put a fence around the server hall and most of the copper disappears from the analyst's spreadsheet.

The constraint can be surprisingly local. Nexans S.A. (Euronext Paris: NEX) is expanding medium-voltage cable capacity in Europe and the United States to serve data centres and solar projects. Its finance chief, Vincent Piquet, told Reuters that a new production line for cross-linked cable takes about three years to build. A utility can secure the metal and still miss its connection date because the cable factory is booked.

S&P Global estimates that annual copper demand attributable to data centres, including a share of power generation and grid infrastructure, will rise from 1.1 million tonnes in 2025 to 2.5 million in 2040. The IEA already sees a potential shortfall of about 25% in primary copper supply by 2035 across the wider economy. AI's particular contribution is to put an exceptionally large customer at a specific grid connection with a date circled on the calendar.

2. Silicon Demand Shows Up In Square Inches

At the Prometheus computing cluster in Ohio, Meta Platforms, Inc. (NASDAQ: META) describes a rack with 72 graphics processors and 20.7 terabytes of high-bandwidth memory. Each processor has 50% more memory than in the preceding configuration. That memory sits close to the chip because a processor that spends its time

waiting for data is a remarkably expensive way to heat a room.

Storage puts a second claim on silicon. High-bandwidth memory keeps a processor working in the moment. Solid-state drives use silicon flash memory to hold far larger volumes of data. Micron Technology, Inc. (NASDAQ: MU) reported in September that it was already shipping two models of data-centre drives to customers for systems that save and reuse calculations as AI models generate responses. Those drives illustrate how the same workload can create an order for memory beside the processor and another for storage elsewhere in the system.

Then there is a number that a higher selling price cannot explain. In the third quarter of 2026, manufacturers shipped 3.756 billion square inches of semiconductor silicon wafers, up 13.4% year over year. SEMI, the industry association, cited AI demand for logic chips, memory, power devices and photonics alongside a recovery in industrial chips. Chip revenue can climb without an extra wafer leaving the factory. Square inches have to ship.

Purity narrows the field. The Semiconductor Industry Association estimated that semiconductors would consume just 2.4% of the world's polysilicon in 2025. Solar applications took nearly all the rest. Five suppliers accounted for most semiconductor wafer production. One of them, Germany's Siltronic AG (Xetra: WAF), tied its expansion of 300-millimetre capacity in Singapore particularly to AI. It sold more wafer area in the third quarter and sales rose 10.5% from the preceding quarter to €355.4 million. Its nine-month gross loss was €48.1 million, largely because depreciation rose after the expansion. The customers have arrived. Shareholders are still paying for the factory.

3. Indium Turns Electricity Into Light

Power reaches a server through metal. Over many of the longer links between servers, data travel as pulses of light. An indium phosphide laser can generate those pulses. Meta says Prometheus uses millions of fibre-strand miles and millions of optical components. Strand miles count each fibre inside a cable separately. A campus can buy a remarkable amount of glass without sending a signal beyond the property line.

One materials supplier has put a number on that change. Yunnan Lincang Xinyuan Germanium Industry Co., Ltd. (SZSE: 002428) reported that its indium phosphide sales volume rose 73.77% in 2025, measured in four-inch wafer equivalents. It attributed the increase to data centres and optical communications. In Japan, JX Advanced Metals Corporation (TSE: 5016) said customers had asked for more indium phosphide substrate than it had expected. In June it outlined plans to increase production capacity roughly seven- to tenfold. By November it was putting up to ¥150 billion over four years behind the expansion. The first company has counted the wafers it sold. The second has told shareholders what it will cost to meet the next round of orders.

The market behind those lasers is small. The U.S. Geological Survey puts 2025 world indium refinery production at about 1,100 tonnes, including roughly 760 tonnes in China. Flat-panel displays still account for much of the metal's use. Yunnan's sales tell us that optical customers bought more wafers. Translating those wafers into tonnes of indium would require knowing how much saleable crystal a producer gets from each batch and how much scrap it recovers.

For a buyer sourcing indium phosphide from China, an order can

be ready while the supplier is still waiting for an export permit. AXT, Inc. (NASDAQ: AXTI) disclosed in its November quarterly filing that its Chinese subsidiary had obtained permits for certain European and Japanese customers while other orders awaited approval. In Texas, Coherent Corp. (NYSE: COHR) has broken ground on an expansion of its six-inch indium phosphide fabrication facility. For a procurement manager choosing a supplier, the date a wafer can cross a border belongs alongside the price.

4. Gallium Earns Its Place In the Power Supply

A data centre distributes electricity at far higher voltages than a graphics processor can use. Each time the voltage drops, some power escapes as heat. Across thousands of racks the operator pays twice, first for electricity that never reaches a chip and again to remove the heat. When the grid connection is already at its limit, cutting those losses can make room for more computing on the same site.

Gallium nitride devices can switch rapidly with low losses. Infineon Technologies AG (Frankfurt: IFX) and NVIDIA Corporation (NASDAQ: NVDA) are developing gallium nitride power conversion for 800-volt AI data centres, including the step down to the accelerator cards. Infineon's AI data-centre power-supply revenue more than doubled to €1.7 billion in fiscal 2026, compared with roughly €500 million for conventional data centres. That revenue covers several semiconductor technologies. A more direct measure comes from the optical side of the business. Yunnan reported 33.18% growth in gallium arsenide sales volume in 2025, measured in four-inch wafer equivalents, and cited demand from data centres and optical communications.

The IEA estimated in 2025 that by 2030 data centres alone could require gallium equivalent to more than a tenth of the world supply available at the time of its assessment. China produced 99% of the world's primary low-purity gallium in 2025. Most gallium is recovered as a by-product of processing bauxite into alumina. A higher price can pay for a recovery circuit. The refinery still needs the right feed and enough of it.

In Western Australia, Alcoa Corporation (NYSE: AA | ASX: AAI) and its partners broke ground at Wagerup in August on a plant designed to recover 100 tonnes of gallium a year, about a tenth of recent global primary output. On November 24, China extended through January 27, 2027 the suspension of certain U.S.-bound export restrictions covering gallium and germanium. Two months is welcome breathing room for a buyer. It is a rather short time in which to build a refinery.

5. Germanium Goes Into the Glass

Indium phosphide helps make the light. Germanium helps guide it. In many optical fibres, manufacturers add a germanium compound to the glass core to change its refractive index and keep light travelling down the fibre. The Fiber Broadband Association has drawn attention to demand for germanium tetrachloride, used to make the glass preforms from which fibre is drawn. Fibre designs vary, so a mile of cable does not translate neatly into kilograms of germanium.

The orders are easier to follow. Corning Incorporated (NYSE: GLW) and Meta signed a multiyear agreement worth up to US$6 billion for optical fibre, cable and connectivity. Corning then reported that third-quarter optical communications sales rose 44% to US$2.38 billion, with sales of its generative-AI products more than doubling year over year. Farther upstream, Yunnan sold 36,035 kilograms of fibre-optic-grade germanium products in

2025, up 49.5% from 24,104 kilograms in 2024. Management specifically cited AI computing and data-centre expansion. Those weights are for finished compounds. What we have here are two independent views of the same market, from the company selling connections and a company selling a material used to make them.

Canada already has a supplier. Teck Resources Limited (TSX: TECK.B | NYSE: TECK) produces fibre-optic-grade germanium tetrachloride at Trail, British Columbia. A July agreement with the Canadian government could help double Trail's germanium and antimony capacity. Germanium is recovered from the feed going through the lead-zinc operation. A buyer hoping for more Canadian germanium has a reason to care what goes into that refinery on any given day.

There are limits to what fibre customers will absorb at a given price. Yunnan said longer negotiations over revised prices weighed on fibre-grade volumes in the first half of 2026. And S&P Global's October draft market study estimates that germanium demand across all fibre optics will rise from 142 tonnes in 2026 to 153 in 2030, with infrared optics accounting for most of the growth in overall demand. AI can change the order book at an individual refinery well before it changes which industry buys the most metal.

What the Electric Car Taught the Market

The lesson of the electric car was that a new customer could change what a refinery made. A battery manufacturer needed lithium in a particular chemical form, at a specified purity, delivered on schedule. AI is now doing something similar across several industries at once. A storage operator orders silicon in finished drives. A laser maker asks for indium phosphide wafers.

And a cloud company can now tell you which Arizona mine is supplying copper for its data centres.

Engineers, of course, have a professional interest in spoiling a perfectly good commodity forecast. NVIDIA estimates that one part of its 800-volt design can cut copper requirements by 45% for a row of racks compared with its 415-volt alternative. Tin goes into electronic solder, yet the International Tin Association expects refined tin use to fall 2.2% in 2026, partly because of weakness in China’s solar market. The specification matters, and the other customers get a vote.