The Tungsten Lesson

written by Jack Lifton | July 21, 2026

After more than sixty years of watching specialty metals industries evolve, I have become suspicious of simple stories. Mining stories are usually simple. Industrial stories never are.

That distinction explains why so many investors lose money in the critical minerals sector. They believe they are investing in industries. More often than not, they are investing in geology. Those are not the same thing.

For decades, governments have published lists of what they call *critical minerals*. I have never been particularly comfortable with that expression. Governments do not actually publish lists of minerals. They publish lists of chemical elements and industrial materials that have become economically or strategically important. That may sound like a semantic argument, but it is not.

That strategic importance is reflected in the Critical Minerals Institute's 2026 Critical Minerals Watchlist, which I help maintain in my role as CMI Co-Chair, working with CMI Watchlist Editor and Director Alastair Neill. In its 2026 update, CMI elevated tungsten into its Top 5 Critical Minerals, citing its essential role in defense, industrial tooling, and advanced manufacturing, together with its highly concentrated global supply and limited Western production capacity.

It is the difference between where value begins and where value is created. Geologists discover minerals. Industry purchases materials.

Investors who fail to appreciate that distinction often confuse ownership of a resource with ownership of an industry. History

repeatedly demonstrates that those are entirely different propositions. One of the recurring themes of this column has been that investors must understand the industrial product, not merely the chemical element from which it is made. I have recently found a simpler way of expressing that idea.

Follow Where Value is Added.

That simple sentence has become the way I evaluate every company involved with strategic materials. Every transformation of a material—from ore to concentrate, from concentrate to chemicals, from chemicals to powders, from powders to engineered materials, and finally into qualified industrial products—adds value. More importantly, every transformation adds knowledge. Knowledge is remarkably difficult to duplicate. Ore bodies can be purchased. Processing plants can be constructed. Equipment can be financed. Experience cannot.

No material illustrates that principle more clearly than tungsten.

When China recently tightened export controls on tungsten, many investors barely noticed. They should have. While rare earths dominate today’s headlines, tungsten quietly underpins much of the world’s manufacturing economy. It receives little publicity because consumers rarely see it. Yet remove tungsten from modern industry and the ability to manufacture precision products rapidly begins to disappear.

Most people think of tungsten simply as a metal. Industry does not. Industry thinks of tungsten as a family of engineered materials. That difference explains almost everything an investor needs to understand.

Metallic tungsten possesses extraordinary physical properties.

It has the highest melting point of any metal, exceptional density, outstanding high-temperature strength, and excellent resistance to thermal deformation. Those characteristics make it indispensable in aerospace, electronics, electrical contacts, radiation shielding, vacuum technology, and numerous other demanding applications. Important as those uses are, they are not what made tungsten one of the foundation materials of modern industry.

The real industrial workhorse is **cemented tungsten carbide**. Tungsten carbide, usually cemented with cobalt—and increasingly with alternative binders for specialized applications—combines extraordinary hardness with exceptional resistance to abrasive wear while retaining a sharp cutting edge under conditions that would rapidly destroy conventional steel tools.

That single material quietly transformed manufacturing during the twentieth century. Modern aircraft engines. Automobile transmissions. Mining equipment. Oil and gas drilling systems. Medical implants. Semiconductor fabrication equipment. Industrial robots. Precision machine tools. All depend, directly or indirectly, upon cutting tools made possible by cemented tungsten carbide.

The modern machine shop does not run on metallic tungsten. It runs on tungsten carbide. That observation may appear to be little more than a metallurgical curiosity. It is not. It explains why investors repeatedly misunderstand the economics of strategic materials.

Mining tungsten ore is one business. Producing a concentrate is another. Converting that concentrate into ammonium paratungstate and other intermediate chemicals requires an entirely different set of capabilities. Reducing those chemicals into tungsten powders requires sophisticated powder metallurgy. Manufacturing

cemented carbides demands still another level of expertise.

Finally, designing specialized carbide grades that aerospace companies, semiconductor manufacturers, automobile producers, and medical device companies are willing to qualify requires years—often decades—of accumulated experience.

Notice what has happened. At every stage of that industrial progression, more value has been added. At every stage, the number of companies capable of performing the work has become smaller. At every stage, competition has become more technical and less dependent upon the price of raw materials. That is where enduring businesses are built. Not at the mine. At the point where knowledge transforms raw materials into products upon which industry depends.

That distinction has become the foundation of my own approach to evaluating companies.

For years I have argued that the West has attempted to rebuild strategic-material industries backwards. Too much attention has been devoted to mines. Too little attention has been devoted to the industrial capabilities that original equipment manufacturers actually purchase.

Original equipment manufacturers do not buy ore bodies. They do not buy drill holes. They do not buy resource estimates. They purchase qualified materials. Delivered on specification. Delivered on time. Delivered consistently. Delivered at prices that allow them to manufacture competitive products. That is where value is added. That is where enduring competitive advantage is created. And that is where investors should begin looking. The obvious question, then, is how investors should evaluate companies operating in the tungsten industry.

The answer is surprisingly simple. Do not begin with the ore body. Begin with the customer. Then work backward through the industrial supply chain, asking one question at every stage: **Where is value being added?**

The tungsten industry provides one of the clearest examples of how that process works because it has been evolving for more than a century. Long before politicians began talking about strategic materials, tungsten producers had already learned that success depended less upon owning mines than upon solving manufacturing problems. That lesson remains as relevant today as it was when cemented carbides first revolutionized machine tools nearly a century ago.

The Foundation: Secure Feedstock

Every industrial system begins with raw materials. Without a reliable source of tungsten concentrate, no downstream industry can exist. That is where companies such as **Almonty Industries Inc. (NASDAQ: ALM | TSX: AII | ASX: AII)** and **American Tungsten Corp. (TSXV: TUNG | OTCQB: TUNGF)** enter the picture. Both are attempting to restore something the West has gradually surrendered over several decades: secure, non-Chinese sources of tungsten concentrate.

Almonty's Sangdong Mine in South Korea is strategically important for its scale and its promise of long-term feedstock security for manufacturers outside China. American Tungsten's effort to restart the historic IMA Mine in Idaho addresses an equally important objective: restoring a domestic American source of production.

These are worthwhile goals. But investors should recognize them for what they are. They represent the **beginning** of industrial capability. Not its culmination. A concentrate is an

intermediate product. It cannot machine hardened steel. It cannot drill an oil well. It cannot fabricate a semiconductor. Someone else must add value before those things become possible.

Chemistry: Where Industrial Specifications Begin

Between the concentrate and the finished product lies chemistry. It is perhaps the least glamorous part of the industry. It is also one of the most important. Tungsten concentrates are converted into highly purified intermediate chemicals, principally ammonium paratungstate, universally known as APT.

APT rarely appears in investment presentations. It should. Without high-purity tungsten chemicals manufactured to exacting specifications, none of the downstream products upon which industry depends could exist. This stage illustrates another principle investors frequently overlook. As technical complexity increases, the number of companies capable of performing the work decreases. Value begins to accumulate because knowledge begins to matter.

Powder Metallurgy: Knowledge Becomes Competitive Advantage

If chemistry establishes purity, powder metallurgy establishes performance. This is where companies such as **Global Tungsten & Powders** and **H.C. Starck Tungsten Powders** demonstrate why industrial capability eventually becomes more valuable than natural resources. Neither company owes its reputation to ownership of extraordinary ore deposits.

Their reputations have been earned through decades of mastering particle-size control, powder morphology, purity, consistency,

sintering behavior, alloy development, and the countless process variables that determine whether an industrial customer can manufacture products reliably. Customers purchasing tungsten powders are not buying chemistry. They are buying manufacturing confidence. They know that every shipment must behave exactly like the previous shipment. Consistency becomes a commercial product in its own right. That kind of confidence cannot be financed into existence. It must be earned.

Engineered Materials: Where Manufacturing Creates Wealth

The transformation of tungsten powders into cemented carbides represents one of the greatest examples of value creation in modern metallurgy. This is the point at which chemistry becomes engineering. The customer is no longer purchasing tungsten. The customer is purchasing machining performance. Wear resistance. Surface finish. Tool life. Productivity.

The material itself has become almost invisible. Its performance has become everything. That observation applies far beyond tungsten. The most valuable industrial materials are often those the end user never notices. They simply make modern manufacturing possible.

Integration and Recycling

One of the most instructive companies in the tungsten industry is **Wolfram Bergbau und Hütten**. It demonstrates that mature industrial systems rarely depend upon a single capability. Mining.Chemical processing. Powder production. Carbide manufacture. Recycling. Each reinforces the others.

Particularly noteworthy is tungsten recycling. Unlike many

industrial materials, tungsten remains too valuable to discard. Used cutting tools become future raw materials. Recovered tungsten reduces dependence upon mining, lowers production costs, strengthens supply security, and conserves decades of accumulated value.

Recycling is therefore not merely an environmental activity. It has become an essential component of industrial competitiveness.

The Chinese Model

Western observers often attribute China’s leadership in tungsten to the size of its mineral resources. That explanation is convenient. It is also incomplete. China certainly possesses significant tungsten deposits. But geology alone never creates industrial leadership. China built its position because companies such as **Xiamen Tungsten**, together with numerous other integrated producers, invested systematically across the entire industrial chain. Mining. Chemicals. Powders. Carbides. Cutting tools. Research. Manufacturing. Customer qualification. China did not merely produce more tungsten. It added more value. That distinction explains why it became the world’s dominant supplier.

The Investor’s Framework

Viewed individually, these companies appear to operate in different businesses. Viewed together, they reveal something much more important. They illustrate how industrial capability accumulates. Each transformation of the material creates additional knowledge. Each additional capability reduces competition. Each successful qualification increases customer dependence. Each layer of expertise becomes more difficult for competitors to duplicate. That is why I no longer begin

evaluating strategic-material companies by asking, “How large is the resource?”

I begin by asking, **“Where is value added?”**

Because every successful industrial enterprise ultimately answers that question better than its competitors. And investors who learn to ask it will usually recognize enduring businesses long before the market does.

Conclusion

Capability Is the Real Strategic Resource

There is a larger lesson here, and it extends well beyond tungsten. For much of the past three decades, Western industrial policy has focused on rebuilding **capacity**. Governments have financed mines, processing plants, demonstration facilities, and manufacturing projects in the hope that industrial capability would naturally follow. Sometimes it has. Often it has not. The reason is straightforward. Capacity can be purchased. Capability must be developed.

A government can help finance a mine. It can help finance a refinery. It can even help finance a magnet plant or a carbide manufacturing facility. What it cannot finance is the accumulation of experience that allows a company to manufacture the same product, to the same specification, day after day, year after year, with the consistency that industrial customers demand.

Experience is not a line item on a balance sheet. Yet it is often the most valuable asset a company possesses. That is why original equipment manufacturers are among the most conservative purchasers in the industrial economy. An aerospace company does not qualify a new supplier because a government has declared a

material to be strategic. An automobile manufacturer does not redesign a production line because a mining company has announced an impressive resource estimate. A semiconductor manufacturer does not accept a new supplier because a demonstration plant has been completed.

They qualify products. Not promises.

That distinction explains why rebuilding industrial supply chains takes decades rather than election cycles. It also explains why China's position in tungsten—and in so many other strategic materials—was not created simply by mining more ore. China built industrial capability. It invested in chemistry. It invested in metallurgy. It invested in manufacturing. It invested in customer qualification. Most importantly, it stayed in the business long enough for experience to compound.

Experience is one of industry's most underappreciated forms of capital. Factories depreciate. Equipment wears out. Patents expire. Experience accumulates. That observation has influenced the way I evaluate every company I study, whether it produces tungsten, rare earths, antimony, gallium, graphite, titanium, or any other strategic material.

I no longer begin with the resource. I begin with the customer. Then I work backwards. What product does the customer actually buy? Who manufactures it? What knowledge is required to produce it? Where, along that industrial journey, is value being added? The answers usually identify the companies with the greatest opportunity to build enduring businesses.

The lesson is neither complicated nor limited to tungsten. Every successful industrial supply chain follows the same progression. Ore becomes concentrate. Concentrate becomes chemicals. Chemicals become engineered materials. Engineered materials become industrial products. Industrial products become customer

solutions.

At every stage, value increases. At every stage, knowledge accumulates. At every stage, the barriers to competition become higher. That is why geology alone rarely creates great industrial companies. Knowledge does. Manufacturing discipline does. Customer confidence does.

The future of the Western critical minerals industry will not be determined solely by who discovers the next important deposit. It will be determined by who learns to transform those discoveries into products that the world's manufacturers cannot do without.

That is the challenge facing every company in this sector. It is also the opportunity facing every thoughtful investor. After more than sixty years of watching these industries evolve, I have learned to ignore much of the promotional language that surrounds them.

Instead, I ask one simple question: **Where is value added?**

It has become the most reliable investment question I know. Because in the end, value is not created where the ore is found. Value is created where knowledge transforms that ore into a product that customers trust. If there is a single lesson that tungsten can teach investors, it is this: **Follow where value is added.**

Do that consistently, and you will understand not only tungsten, but rare earths, antimony, gallium, graphite, titanium, beryllium, and every other strategic material upon which the industries of the twenty-first century will depend.

The geology may attract the headlines. The capability will create the wealth.