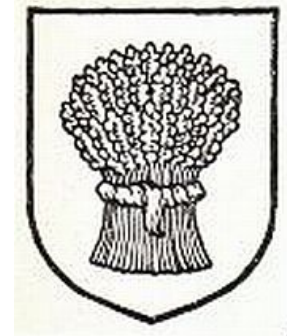


Thursday, 30 January 2025



HALLGARTEN + COMPANY

Sector Coverage

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Tungsten Review: A Matter of Urgency January 2025

Company	Strategy	Ticker	Currency	Price	Mkt Cap mn	Stage
Almonty Industries	LONG	All.to All.ax	CAD	\$1.10	\$328mn	Producer
EQR Resources	LONG	EQR.ax	AUD	\$0.31	\$72mn	Producer
Guardian Metal Resources	LONG	GMET.L	GBP	£0.33	£41mn	Developer

Tungsten Review

A Matter of Urgency

- + Tungsten has essential uses in industrial and military applications, such as armour-piercing weaponry and in armour (e.g. for tanks, APCs) to resist these weapons
- + Production is being rebalanced away from China, gradually
- + Western end-users fended off the danger China represented to core industries, such as machine-tools, by supporting non-Chinese production start-ups
- + Nevertheless, wannabe miners are few with a high attrition rate over the last decade
- + Most projects are revivals of past producers rather than *de novo* mines
- + The serious companies, left over from past “good” times, are still advancing projects and expanding production (when they can)
- ✗ The Tungsten (APT) price at ~US\$340 per MTU has scarcely moved in response to Chinese restrictions on dual-use W exports to the US
- ✗ The Chinese export ban (and associated sabre-rattling) failed to achieve the desired panic due to rising non-Chinese production
- ✗ China still has the firepower to cause damage by predatory actions (e.g. on price) to the downside
- ✗ The long downtime has resulted in virtually no exploration work for a decade

Tungsten – Retaking its Place in the Sun

There were few survivors of the Tungsten slump that had ravaged the subsector since the start of last decade. Now, Tungsten has “turned on a dime” with its role as the prime military metal prompting a rush to restock supplies and reestablish non-Chinese supply-lines in this critical metal for Western defense and industry.

Post-2011, the slumping price of Tungsten wrought destruction upon both the explorers AND the producers (with two major Western producers going under). The explorers largely faded into mere shadows or repurposed their vehicles as something else.

In this review of the Tungsten sector, we shall endeavour to update investors on the changed (and the constant) dynamics of the metal and review some of the players and their projects and where they are on the continuum towards production at this point.

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Wielding the Big Stick – the Dual-Use Ban

The latest Chinese measures have roiled sentiments, but not necessarily prices, in the Tungsten market. Certainly, compared to the Antimony measures, the Chinese feint in Tungsten may be seen as rather a damp squib. When the history books are written the measures may be seen as a longer-term driver of Tungsten prices (yet having flopped in the first instance) and may also be seen as a catalyst for the eclipse of China as the sole decisive factor in the Tungsten.

On the 3rd of December 2024, China announced stringent export restrictions on “dual-use” technologies for both civilian and military use, specifically targeted at the United States. The new restrictions had two notable aspects:

- It was the first time Chinese critical minerals export restrictions were targeted at the United States rather than all countries
- It was the first time restrictions on critical minerals were a direct response to restrictions on advanced technologies

Some interpreted this as a sign that critical mineral security was now intrinsically linked to the intensifying tech trade war. However, we regarded the Gallium/Germanium measures in 2023 as specifically linked to tech (namely semi-conductors), while we have interpreted the dual-use ban on Tungsten as distinctly military linked.

Interestingly though the most recent USGS Tungsten Review states that import sources (2019–22) for the US of ores, concentrates, and other forms were: China at 27%; Germany at 12%; Bolivia at 9%; Vietnam at 8%; and others at 44%. In light of rising non-Chinese production, the dual-use ban might only serve to accelerate the erosion of China’s market share and thus dominance.

Tungsten as a Military Metal

If we had to choose a metal to crown as the military metal *par excellence* it would undoubtedly be Tungsten for its usage in shells and in armour-plating to resist said shells.

While Tungsten means “heavy stone” in Swedish, its main source since its rise to industrial usage has been the Iberian peninsula. This produces an interesting history which has relevance today because it is the back-story to the massive tug of war over Portugal and to a lesser extent Spain during WW2. In this story lies some good examples of our “supply & deny” watchwords.

Following the invasion of the Soviet Union, Germany became dependent on Portugal and Spain for their Tungsten supplies, due to its value in producing war munitions. To maintain its neutrality, Portugal set up a strict export quota system in 1942. This concept of neutrality through equal division of products supplied to belligerents was different from that of the Northern European neutrals who worked on the

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basis of "normal pre-war supplies". However, in January 1944, the Allies began pressuring the Portuguese dictator Salazar to embargo all Tungsten sales destined for Germany. Portugal resisted, defending their right as a neutral state to sell to anyone and fearing that any reduction in their German exports would prompt Germany to attack Portuguese shipping.

Despite the seeming closeness of Franco to Hitler, he was also a fence-sitter and had to do an even more perilous balancing act, thinking forward to what might happen if he was unequivocally seen as tied to the Nazis should they not win. At the top end of Europe, Hitler had neutral Sweden blackmailing him over iron ore supplies and to the East he had to contend with a "friendly" Romania over oil supplies. Such is the dilemma, writ small, that China will have if it ever decides to go ballistic (pardon the pun).

What makes Tungsten, the key military metal?

- It is used in making bulletproof vehicles, armored tanks, and other kinds of protective equipment designed to withstand the high-speed impact of bullets. This is due to the hardness of Tungsten. And this property, as well as others, can be enhanced through alloying to yield stronger composite materials.
- It is used in making armor-piercing rounds. These are designed to pierce through protective armor and vehicles designed to be bulletproof. Tungsten can tolerate high levels of shock and does not easily shatter.
- It is used in making high-speed cutting tools. These tools are usually made of high-speed steel, and they cut much quicker than ordinary carbon steel. Tungsten's ability to withstand high temperatures makes it indispensable in fabricating these tools and when cutting at such high speeds.
- Tungsten is also used in the manufacturing of rocket and aircraft parts. It is instrumental in manufacturing parts like engines because of the high temperatures they have to withstand. Tungsten has a high thermal resistance and can withstand high temperatures without defect.

Tungsten is one of those metals where the fluctuating price makes it hard to plan a company's trajectory for more than a couple of years. The wild ride in pricing since 2008 made it particularly difficult to chart these waters. Now the trend is turning positive again with a firming price meeting a marketplace that has been deprived of new projects and seen most of the explorers vaporize. Even though the recovery is now in place Tungsten is a metal that has failed to capture the market's interest due to generalized ignorance of Tungsten and its supply/demand dynamics.

The History of the US Government & Tungsten

In 1939, the United States Congress enacted the Strategic and Critical Materials Stock Piling Act, a federal law providing for the acquisition and retention of stocks of certain strategic and critical materials that supply the military, industrial and essential civilian needs of the United States for national defense.

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Then in 2021 the US government announced plans to recapitalise and restore the National Defense Stockpile of critical minerals and materials, following findings from the reviews directed under Executive Order 14017. In March 2022, the Departments of Energy, State and Defense executed a memorandum of agreement to launch an effort to include critical minerals necessary for the transition to clean energy alongside those needed for defense purposes

On the 14th of May 2024, the Biden Administration announced a 25% tariff on Chinese Tungsten imports with effect from the 1st of August 2024.

This measure resulted in a bifurcation of viewpoints. One school of thought (to which we pertain) saw the measure as further increasing the attractiveness of American mined and processed Tungsten and as a further prod to reboot Tungsten production outside of China.

However, industrial interests (and permacritics of the now departed President Biden) saw the decision “to slap a steep 25% tariff on Tungsten and its products from China..... as nothing short of disastrous”. Of course, the industrial users, long propounding the “Cheap Rules!” school of thinking, have been in the ascendancy for 40 years and have singularly done nothing to encourage or fund Tungsten supply chains independent of China.

The difference is poignant, between those in the tool industries in Europe that paid over the market rates for W, from the likes of Almonty to sustain a non-Chinese supply chain in this critical metal, and those industrial users in the US that pandered to China’s hegemonic tendencies in this and other strategic metals due to solely “bottom-line” considerations.

The EU (and UK) – Where Circularity becomes Reality

The EU categorized Tungsten as a “critical raw material” and yet it did the same with a swathe of other metals. The rubber rarely meets the road in Brussels as there is, too often, a triumph of form over content. The sourcing of such critical metals was overlaid by the delusion of the “circular economy” and pandering to rampant NIMBYism.

The irony is that Europe is way ahead of the US in Tungsten production with mining operations in Portugal, Spain and Austria. None of this is by design, we might note, but rather historical momentum. The potential to turn back on substantially more production in the Iberian Peninsula (and the UK) is particularly poignant. One might almost say that the closest that Europe comes to achieving a circular economy in any critical metal is in Tungsten.

Devastation Wrought

In the most heated part of this battle for dominance the slumping price of the metal wreaked destruction upon the Tungsten exploration names AND the producers (with Malaga, North American Tungsten, Woulfe Mining and Wolf Minerals & its successors succumbing to administration). The explorers largely faded into mere shadows or repurposed their vehicles as something else.

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Meanwhile consolidators like Almonty Industries picked up failing producers as part of its global roll-up strategy and determined explorers made the sacrifices necessary to remain in the land of the living.

The Battle for the Machine Tool Market

Western machine tool makers are particularly vulnerable to supply disruptions as it is up against China, making a major push into the tool space and thus we might tactfully say that it would be to the benefit of Chinese toolmakers to have foreign competitors experience supply problems from the Chinese Tungsten mines. If any investors doubt that that might happen then they would be naive indeed.

As the (potential) prime victims for a Chinese grab at the machine tools, drills and general tools market the Germans and the Swedes had a vested interest in seeing the Chinese kept from global domination of Tungsten mining. The Western end-users in the tool space, breaking with orthodoxy, decided to pay more for “secure” Tungsten supplies than the “market” price which the Chinese set.

This was accompanied by specified targeted support for up-and-coming players like Wolf Minerals and Almonty Industries. The support also manifested itself with Wolfram Bergbau backing King Island Scheelite and Chronimet backing Mt Carbine.

The strategy had its shortcomings with Wolf (sometime owner of the ill-starred Hemerdon) and King Island Scheelite going under (as did some other players like Ormonde). Mt Carbine (now embedded in EQ Resources) has turned out to be a very long-fuse transaction.

Through close cooperation with the upcoming producers and consolidators, the end-users managed to dodge the Chinese bullet and not at a particularly high price to themselves. This shows that a symbiotic relationship can be developed between miners and users. Not that we ever doubted that...

It is also an interesting to contrast the European approach to the way in which the Japanese and Korean industrial sectors just rolled over and played dead in the face of Chinese onslaughts on their strategic industries. One can note though that some effort was made to try and “pick winners” such as Korea Zinc with Woulfe Mining and Sojitz acquiring Panasqueira, but both of those efforts ended in tears. All indications are though that Koreans are warming to the potential of once again having their own vertically integrated Tungsten industry.

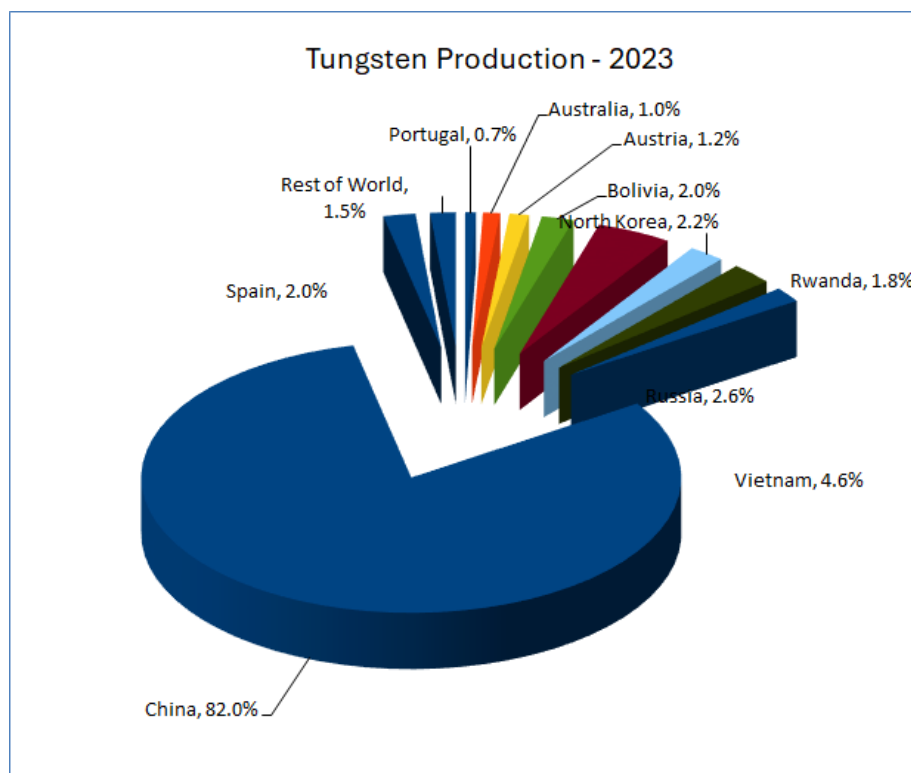
Shifting Production

In the past we have focused where production has been with some mentions of the stalled projects for the future (maybe). Now we can see that there is potentially a major sea-change in the balance between China and ROW, and where in the ROW the production comes from, particularly as China was expected

to be a net Tungsten importer by the mid-2020s (which did not occur).

For the last decade primary supply has lagged some way behind demand, enabling large stockpiles to be drawn down and also requiring considerable supply of secondary Tungsten to meet demand. China accounts for a substantial proportion of primary supply, accounting for ~82% in 2023. A number of large state-owned mines were facing depleting ore grades, which is likely to lead to lower output from existing operations over the next decade. When they still existed, the consultants Roskill anticipated that China's market share to drop to below 72% by 2029, unless new operations can come online to offset the fall from depleted assets.

Countries that have faded long ago, like Australia and South Korea have the potential to become major producers, while some that produced in recent times, like Canada and Peru are totally sidelined, and major producers from further back, like Spain and Portugal, are getting a second wind. Indeed, the latter two countries should dominate non-Chinese production from now for at least the next decade.



Source: USGS

This moving feast means that, besides China and Russia, other principal producing countries are Austria, Bolivia, Portugal, Spain, Rwanda and Vietnam whilst mines have closed since the turn of the century in Australia, Brazil, Canada, France, Japan, Peru, South Korea, Sweden, Thailand and the USA. The price slump post-2011 knocked players like Canada, Peru and Australia out of the running. The UK has been

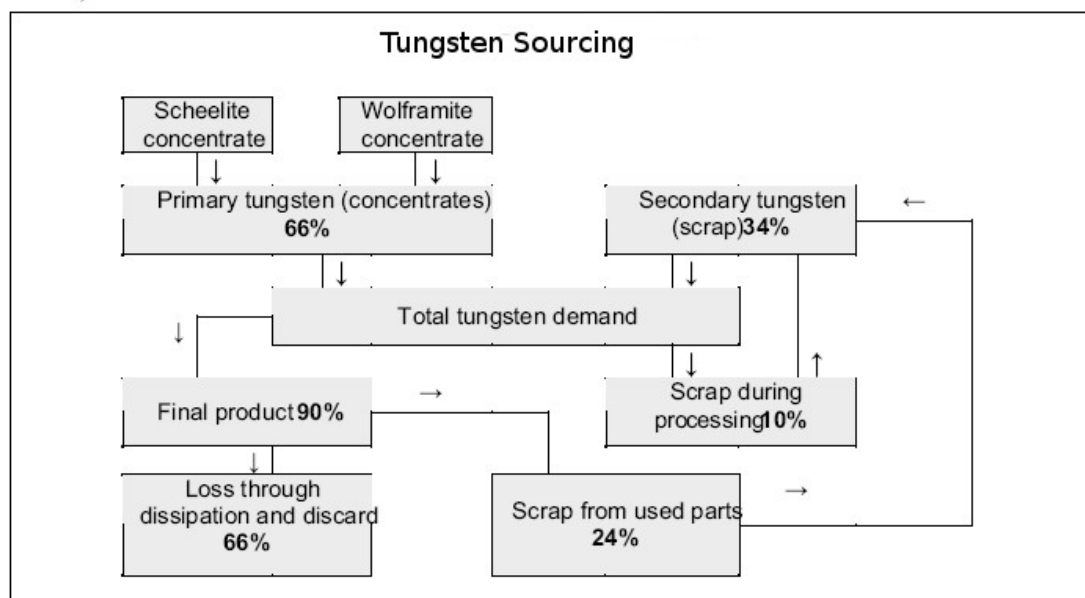
sometimes producing and sometimes not due to the travails of Hemerdon.

The latest assessment of the USGS (from 2023) is that China has 52% of global Tungsten resources (down from 61% in 2016), Canada had 9% in 2016 and now is not even shown, while Australia is credited with 13% lately and Russia with 9%. However, it is not which country currently has the resources that matters but the country that gets into production first. Thus, Portugal currently has more going on in the Tungsten space than Canada does, while South Korea currently has no production but when Almonty get their Sandong operation going it should return to the producers' table. Curiously Korea does not figure in the USGS's ranking of major resource holders (despite its putative mine once being the world's largest).

Two large-scale Tungsten mines in Spain came online in 2019, these were La Parrilla (controlled by W Resources) and Barruecopardo (then owned by Ormonde and later controlled by Saloro). The former came to grief and the latter is now owned by EQ Resources. Both were looking to ramp up production in the following years, with output expected to peak in the mid-2020s. Production from both operations was scheduled to contribute over three thousand tonnes per annum of contained Tungsten. But reality intervened and the Grim Reaper cast these aspirations aside.

Process

The sources of Tungsten are Scheelite mineralisation and Wolfram mineralisation with scrap variably making up around a third of the total (but very dependent upon pricing to tempt it out of the hands of holders for economically viable reprocessing).

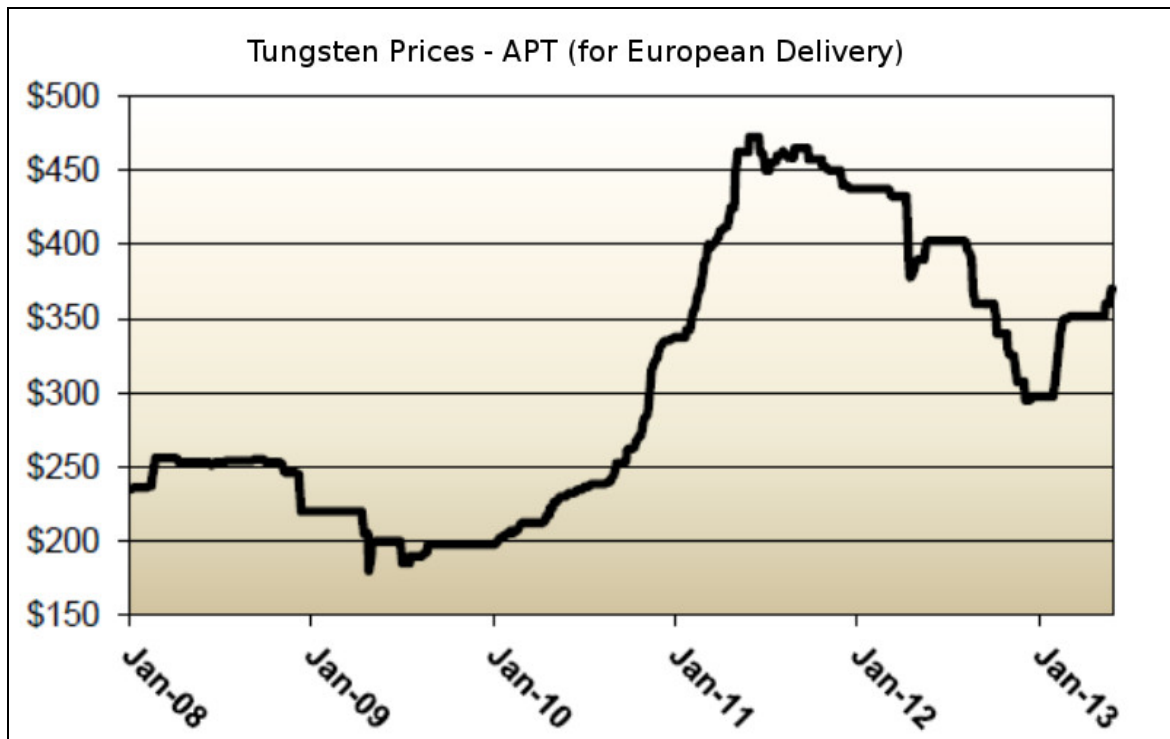


Pricing

The average annual price of Tungsten since 1950 fluctuated between a nadir of US\$10 per metric ton unit in 1963 and a peak of US\$175 in 1977. After that point it sagged back to trade in a \$50-75 band for several decades before its revival in the new century.

The trade in concentrates diminished and the market relied more and more upon the APT quotation as a price guide since APT is the product traded in the largest quantity. Prices are mainly based on the quotations published twice a week by Fastmarkets, although other trade journals also publish quotations or indicative prices.

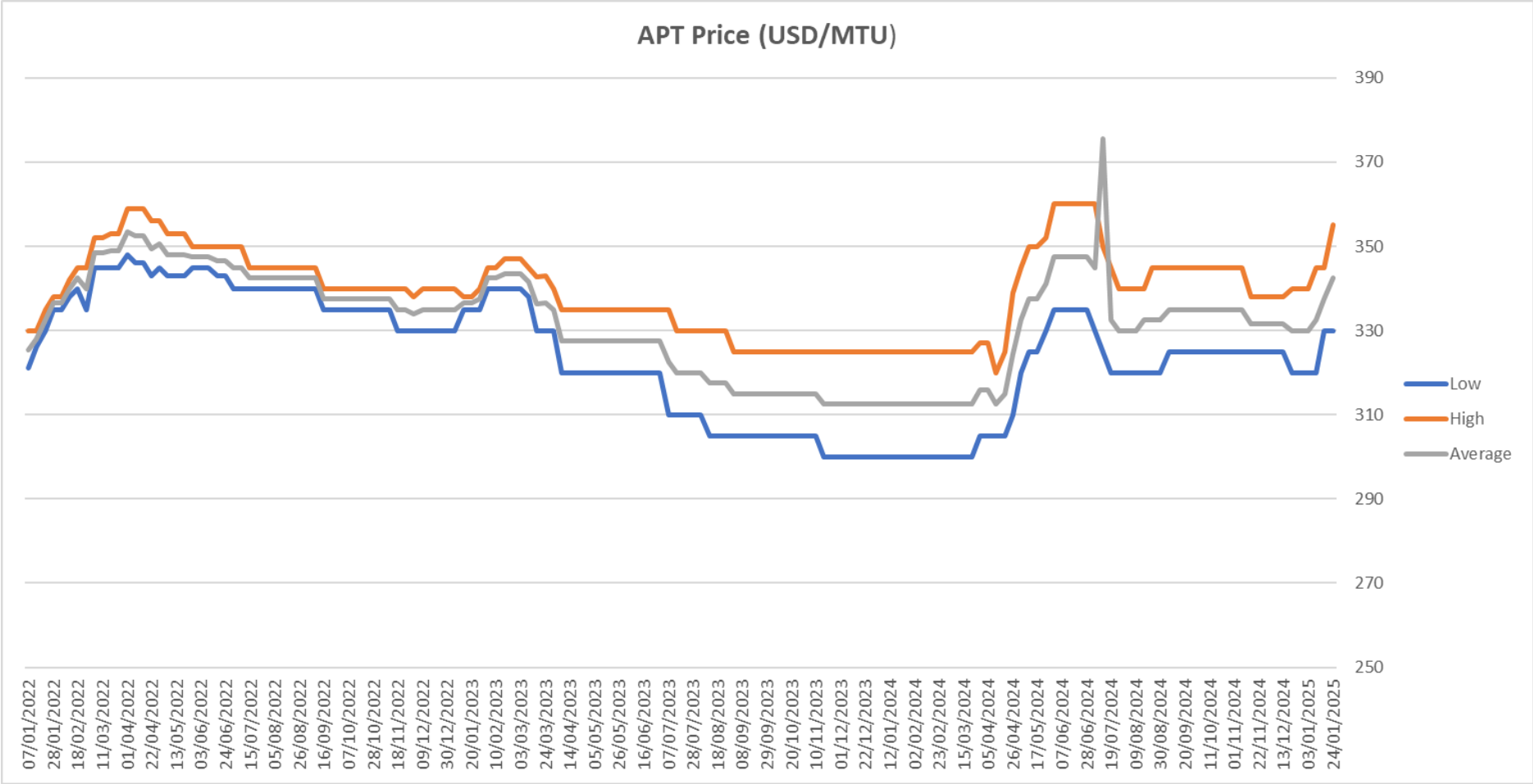
The chart below shows the price trends for APT during its “boom” period post-2009.



The Tungsten price was blissfully boring in 2023 as all around it wilted in the backwash from China’s abandonment of the Zero Covid policy. The lack of a “spike & dump” meant that few were attracted into the space and those that are already in the space, pursue their projects *sotto voce*, or wither on the vine.

There is little probability of a Rare-Earth/Lithium-style promotorial surge, particularly as the carpetbaggers *du jour* are busying themselves with Antimony.

The chart on the following page shows that Tungsten has recently awoken from a long static period and is challenging the highs of this decade.



Source: Fastmarkets/Almonty Industries

Increased Tungsten usage by military and industrial users should lead to increased competition for Tungsten concentrates in the global market between Chinese and non-Chinese processors and consequently result in an improving price structure for Tungsten and its products in the future. A jump in the price of APT to over \$400 would not be unthinkable.

Our latest projections are shown in the table at the right:

It is worth noting though that these prices are still way below the nearly US\$470 per MTU of Ammonium Paratungstate that was achieved in the first half of 2011. While the wild gyrations pushed APT prices to levels which fired up the industry it was those movements which ultimately ended most of the players in the space.

Tungsten APT Pricing	
Year end	MTU (US\$)
2023	\$312
2024	\$375
2025e	\$415
2026e	\$460

Sources – Old & New

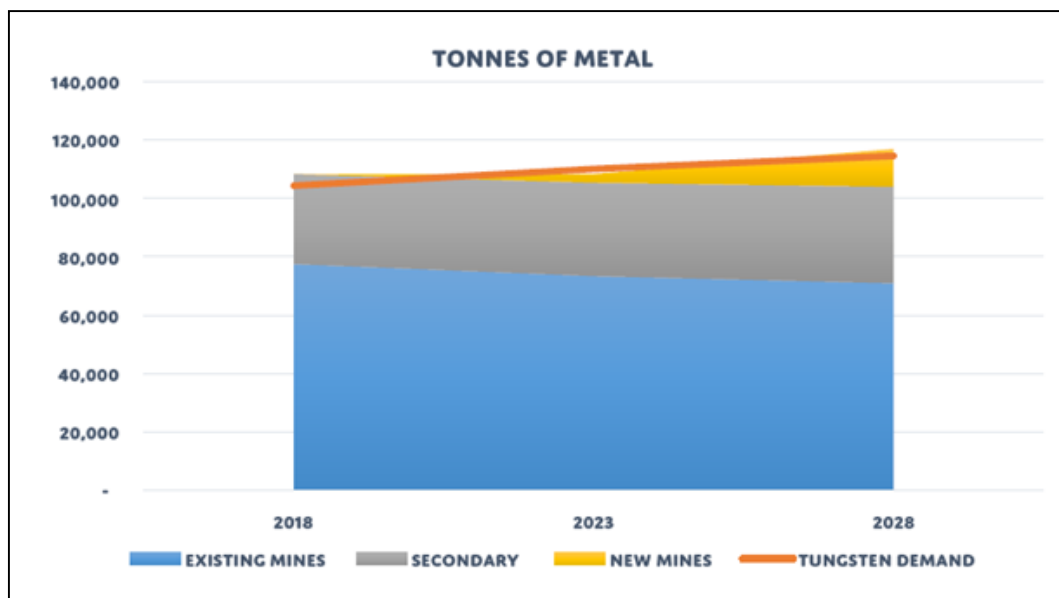
The global primary Tungsten market is estimated to be ~75,000 tons Tungsten metal per annum, but with China being both the largest producer and the largest consumer the old factor of disinformation comes into play.

Growth in Tungsten demand is closely correlated with global GDP with global demand for Tungsten forecast to grow by ~1.3% annually over the period 2019-2029.

The long spell of torpid pricing has had the effect that the pipeline of new projects is largely empty and even if potential mines were started on the road to permitting there would be little new significant supply (except Sangdong) over the next 3-4 years. Moreover, further price advances for Tungsten concentrates and products would be necessary before any new major mining programs could stand a chance of gaining funding. As we have seen APT prices went off a cliff with the global slump of 2012 and any miners with aspirations to get into production ended up shelving plans for the duration of the slump. This only served to accentuate the China-dependency of the industrial users of Tungsten.

Factors militating against a ramp up in production included:

- ✘ long lead times between exploration and new mine openings
- ✘ the steep rise in mine development and operating costs
- ✘ the very limited availability of high-grade deposits (i.e. greater than 0.6% WO₃)



Source: Northcliff

The rising tide of new producers (mainly in Iberia) and, in particular, Almonty's Sangdong mine in South Korea are toppling Chinese dominance in this metal that they had hoped to use to clobber the West German machine tool industry with.

The metal's potential sources are quite geographically diversified with Tungsten (or Wolfram) resources located in China, Canada, Russia and the United States, at least in the official versions. And yet the largest sources of production outside China are Spain/Portugal, Australia and, shortly, South Korea.

Scrap has been an issue with a high X factor in unknown levels of stocks awaiting the right price to be mobilized. Pricing services/consultants have noted that there are reports of the existence of sizeable scrap stockpiles.

Our Favoured Names

Our prime Tungsten play has long-been Almonty Industries (All.to | All.ax), the producer (in Spain, Portugal and soon South Korea). In recent times we also added EQ Resources to our Model Resources Portfolio, which has production in both Australia and Spain. In recent weeks we have launched coverage on Guardian Metal Resources (AIM: GMET | OTCQX:GMTLF), a developer in Nevada, that is being well-seen in Washington.

Meanwhile, consolidators like Almonty Industries and EQR snapped up failing producers as part of its global roll-up strategy and a few determined explorers made the sacrifices necessary to remain in the land of the living.

With a major Tungsten deposit in the US's most mining friendly jurisdiction, Guardian Metals is well-positioned to be the North American supplier of this key military metal. Now it must make the jump from developer to producer.

GMET Doubles Up

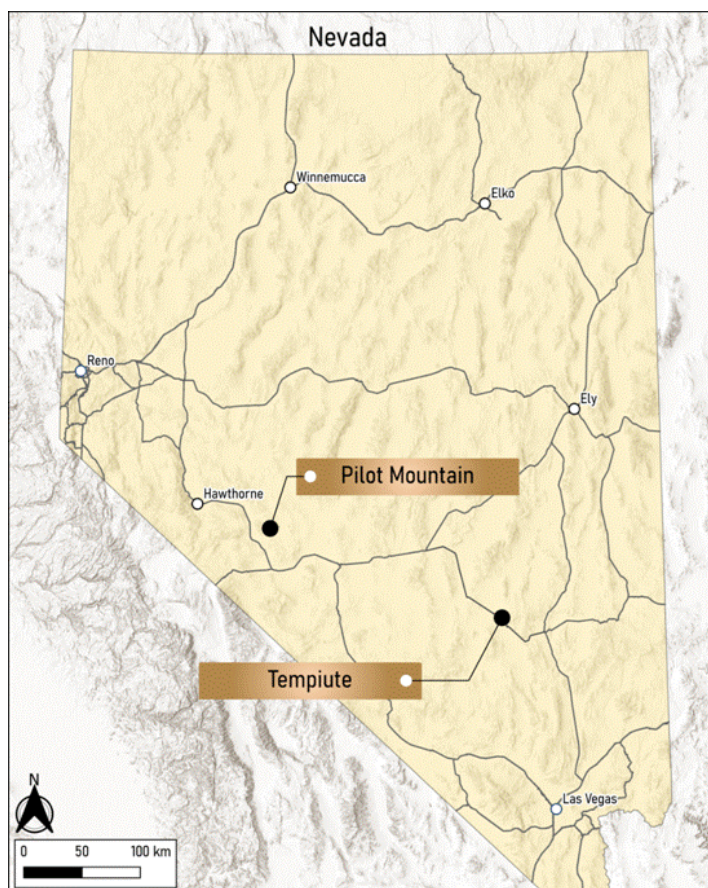
As we had noted in our [initiation of coverage on GMET](#), the company was already strategically positioned in the US with the past-producing Pilot Mountain mine in Nevada. In late October, GMET announced that it had entered into a binding letter of intent (LOI) with Hinkinite Resources LLC to acquire an option for the acquisition of the Tempiute Tungsten Mine & Mill. Tempiute, also formerly known as the Emerson Tungsten or Black Dog Mine, is located in south-central Nevada some 237 km north of Las Vegas and only 290 km by road from Pilot Mountain.

Formerly the Emerson Mine, the project was explored and mined for Tungsten, Silver and Zinc intermittently over the last century. It was most recently operated by United Carbide from 1977 to 1987, ceasing operations due to a crash in Tungsten prices following market flooding by Chinese producers.

The majority of the known mineralisation at the project is located within 10 patented claims which provide exclusive ownership of the land, minerals, and all resources. The project also comprises six unpatented Bureau of Land Management (BLM) millsite claims, four BLM lode claims and two BLM placer claims.

The two placer claims cover the historic tailings located less than 1.5km from the project. The tailings measure approximately 300m x 300m and, according to GMET, are believed to be circa 10-15m thick. GMET considers that multiple recoverable metals may still exist within the tailings, which might allow for near term reprocessing if sampling results prove promising.

Six high-grade stockpiles exist within the project which were not processed in the 1980s due to the lack of technology available to efficiently process sulphide rich material. GMET management feels that today's technology is well advanced to efficiently process this type of material.



Multiple historical resource estimates have been reported on the project but, at the time of deal being announced, the documentation pertaining to these estimates has not been located by GME. However, an internal report by a previous owner outlined a combined Measured, Indicated and Inferred estimate of 8mn tons grading 0.43% WO₃. Further work will be required to confirm these estimates, but the bonus payment as detailed below is based on the above estimate.

The Deal

The acquisition of the option is subject to the satisfactory completion of due diligence by GMET within 90 days of the signing of the LOI then at that point a cash payment of US\$50,000 will be made to the optionor along with the issue of 150,000 Guardian shares.

Following execution of the Definitive Agreement and until such time as the option is exercised or the Definitive Agreement is terminated, Guardian Metal will pay the optionor a cash payment of US\$25,000 at the end of each six-month period following the date of the Definitive Agreement.

To exercise the option, GMET will be required, within three years of the date of the Definitive Agreement, to establish an MRE for the Tungsten Trioxide (WO₃) component with a minimum cutoff grade of 0.4%. Then within five business pay the optionor a bonus of US\$100,000 for each 3,100 tons WO₃ of such Maiden Resource, equal to US\$1mn for a 31,000 ton WO₃ Maiden Resource, up to a maximum bonus payment of US\$2mn.

There is also an NSR component equal to 1.5% of the net smelter returns from all mineral production from the project. GMET may, at any time, repurchase 50% of the NSR Royalty for a one-time payment of US\$1mn, payable in cash or in Guardian shares

With this transaction GMET potentially becomes the only US-domiciled source of primary Tungsten concentrate production.

Almonty Industries (TSX: AII | ASX: AII) – First Mover Advantage

We have covered this company for over ten years now. As previously noted, Almonty's survival and expansion has been encouraged by European machine tool makers prepared to pay over the "market" price for APT to ensure that Almonty survived and prospered as an alternative to the inevitable Chinese near-monopoly if it had gone under.

However, before Almonty there was Woulfe Mining Corp. which had, in 2006, secured title of the property which was historically the largest tungsten producer in South Korea. Those with long memories will remember our coverage of that entity.

The Almonty Korea Tungsten deposit (aka the Sangdong Mine) hosts one of the largest tungsten resources in the world. The mine was the leading global tungsten producer for more than 40 years and it has the potential to produce 50% of the world's Tungsten supply (ex-China output). At one point it

contributed more than 50% of the country's export revenue. However, as with almost all other metallic mines in South Korea, it closed in the 1990's primarily due to low commodity prices (special thanks to China... again), at a time when South Korea was emerging as a manufacturing powerhouse with companies such as Hyundai, LG, Samsung and POSCO on the rise.

The mining industry was relegated to an insignificant corner of the economy, now contributing less than 0.5% of the GNP. In fact, in recent years, there appears to be a widespread perception in South Korea that the former mines were fully exploited, never to be re-opened. The former owner of the Almonty Korea Tungsten mine, Korea Tungsten Co., evolved into Korea's largest manufacturer of Tungsten cutting tools and hard metal tools with the only integrated Tungsten production plant in the world, known as TaeguTec Ltd (owned by Berkshire Hathaway).

Almonty picked up the mine from the smoking corporate ruins of Woulfe in 2015. Since then, it has been on a path to reactivation of the mine, but that process was stymied (as it was for so many others) by the lingering torpid pricing in the Tungsten market. The pace of construction/development has picked up since Tungsten's turn for the better two years ago. The return to production is imminent (expected in 1H25). The Sandong operation, when it gets going, might account for 7% of global production and fully 50% of ex-China output.

Almonty's main operation is the Panasquiera mine in Portugal which moved into poll position amongst European Tungsten mines when Almonty's other operation, Los Santos (which we visited and write up in 2015), which is in north-west Spain, came to the end of its mine-life recently. The company is keeping its powder dry thus far on the greenfield Valtreixal mine/project which is relatively near to Los Santos.

Almonty is by far the leading non-Chinese producer and looks set to extend that lead when Sangdong gets into its stride. However, a key difference between Almonty and some of the other players is that Almonty has not pursued a vertical integration strategy. At least not thus far.

Vertically Integrating

The two players that are straddling the upstream and downstream in the Tungsten supply chain are Masan High-Tech Industries and EQR Resources. These players are dealt with in Appendix II.

The US – Back into the Fray

The sad state of the Tungsten space in the US is evidenced by the fact that the metal has not been mined commercially in the United States since 2015.

According to the USGS's latest publication on Tungsten, approximately six U.S. companies had the capability to convert Tungsten concentrates, ammonium paratungstate (APT), Tungsten oxide, and (or)

scrap to Tungsten metal powder, Tungsten carbide powder, and (or) Tungsten chemicals.

As for applications, an estimated 60% of the Tungsten consumed in the United States was used in cemented carbide parts for cutting and wear-resistant applications, primarily in the construction, metalworking, mining, and oil- and gas-drilling industries. The remainder was used to make various alloys and specialty steels; electrodes, filaments, wires, and other components for electrical, electronic, heating, lighting, and welding applications; and chemicals for various applications. The percentage of those two categories that ultimately end up in military-linked applications was not revealed.

The worm has turned though and the Department of Defense (DoD) in the US has seen the error of its ways in allowing its suppliers to become China-dependent in their sourcing. The war in the Ukraine and Chinese sabre-rattling over Taiwan and the South China Sea have accentuated the concern.

This has prompted a funding program for the development of onshore Tungsten sources.

Riding the Washington Express

Developers in the specialty and critical metals spaces (and even in some base metals) now talk more of Washington D.C. than they do of Perth and Vancouver. One of the most propitious sources of funding these days is not the likes of private equity funds in mining, but rather the DPA III program of the U.S. DoD which is developing a policy of supporting worthy critical minerals projects.

The problem for pure promoters though is that the DoD is, careful, technical and diligent. They see through a pure promoter with night vision goggles.

As we noted in our recent Initiation of coverage of Guardian Metal Resources, its Pilot Mountain project hosts one of the few Tungsten projects in North America that has their interest, and therefore is well positioned for funding. In an interesting sidenote, in a publicly-released briefing from the US DoD's NDIA Manufacturing Division, it was disclosed that three Tungsten projects were in line for funding and one of those mentioned was Guardian Metal's Pilot Mountain, with a date of grant shown within 2024. The size of the funding was not revealed, nor is this written in stone, as the award was not officially announced.

Risks

The risks for the Tungsten space in general. These are:

- ✘ A return to a weak Tungsten price
- ✘ An outbreak of peace around the world
- ✘ Weakened global industrial demand (particularly in tools) that would soften price & volumes
- ✘ China skewing the market in some way to again create distortions in price and trade patterns

- ✘ A tough financing market for junior explorer/developers

Most of these risks are different sides of the same price prism, with the exception of the market's perception/disinterest in Tungsten.

China is not alone in creating scenarios in which prices will move higher (or lower). US tariffs are being used to make non-Chinese production of Tungsten more attractive. Many feel that China may look to restrict exports of Tungsten, as they did with Antimony, for strategic reasons.

Financing remains difficult and dilutive when it takes place. The only way to harvest the more attractive price is to be in production and the only way to do that is to finance mine-builds/reactivations.

Conclusion

Historically, Tungsten is one of those metals where the fluctuating price makes it hard to plan a company's trajectory for more than a couple of years. The wild ride in pricing since 2008 made it particularly difficult to chart these waters. Now the trend is turning positive again with a firming price meeting a marketplace that has been deprived of new projects and seen most of the explorers vaporize. Even though the recovery is now in place, Tungsten is a metal that has failed to capture the market's interest due to generalized ignorance of its supply/demand dynamics. With the slow steady recovery in the price since mid-2017 there now exists a window of opportunity for Tungsten plays in the western world as end users look to secure alternative and more reliable sources of supply than China.

After years of low prices, with few new discoveries and developments, it is no surprise that Tungsten had fallen out of sight of investors and promoters (maybe not a bad thing). The mantra now though is Production, Production, Production. Having projects that are on the drawing board, and unlikely to leave it, does not charm funding out of the military in ANY country. This sets up a scenario where the non-serious will hopefully be relegated to a distant second place in the attentions of the markets.

The brutal market over the last decade resulted in "ethnic cleansing" of the listed Tungsten space with few survivors. This means that, despite the strong rise in the Tungsten price, there are few projects in the pipeline and little sign of newcomers joining the fray.

The broader economic recovery should lead eventually to increased competition for Tungsten concentrates in the global market between Chinese and non-Chinese processors and consequently result in an increasing price structure for Tungsten and its products in the future. A rise in prices of APT to over \$400 in 2024 is not unthinkable and indeed likely if China restricts Tungsten exports.

Fortunately, Tungsten offtakers are proactive participants in the development of producing assets in this metal in a way that is not evident in other specialty metals.

APPENDIX I:

China & Tungsten

China Throwing its Weight Around

Tungsten, in theory, should be a bellwether of industrial activity, more than virtually any other metal, as it is directly levered into machine-tool manufacturing as the swing factor in its demand (the relatively non-variable part being lighting uses). However, the “spoiler” here is China which has long-distorted the Tungsten market, much as it has distorted so many others.

Now we have a situation where military and industrial demand is recovering making it harder for China to maintain low prices (to maintain its dominance). Moreover, China’s attempts since 2010 to overrun the machine tool sector through its Tungsten dominance put Western manufacturers of this equipment on notice that they needed guaranteed non-Chinese supplies to evade predatory Chinese manouevres.

Wielding the Big Stick – the Dual-Use Ban

We repeat here what we said earlier because the Chinese measures are a driver of Tungsten prices and yet may also be a catalyst for the eclipse of China as the sole decisive factor in the Tungsten.

On the 3rd of December 2024, China announced stringent export restrictions on “dual-use” technologies for both civilian and military use, specifically targeted at the United States. The new restrictions had two notable aspects:

- It was the first time Chinese critical minerals export restrictions were targeted at the United States rather than all countries
- It was the first time restrictions on critical minerals were a direct response to restrictions on advanced technologies

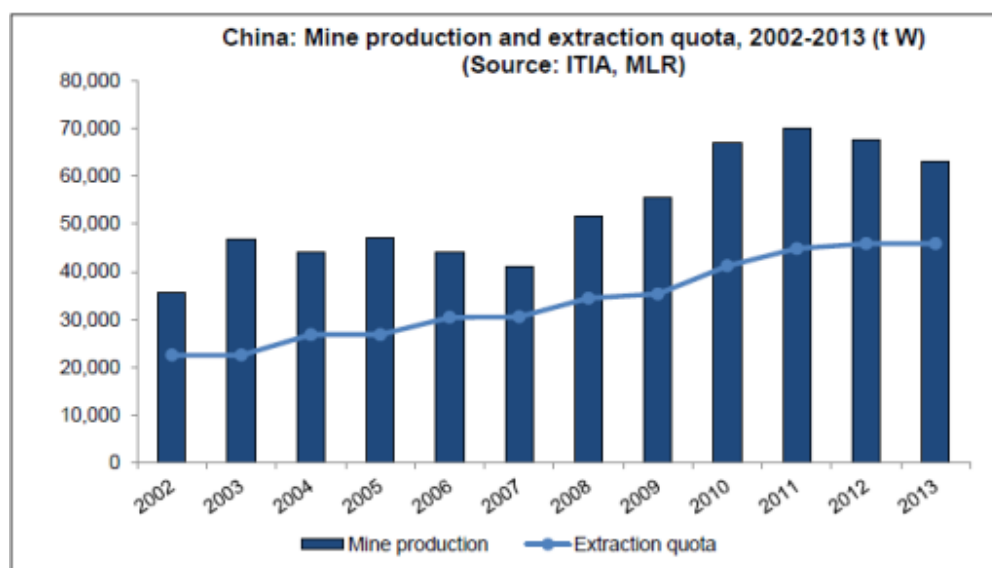
Some interpreted this as a sign that critical mineral security was now intrinsically linked to the intensifying tech trade war. However, we regarded the Gallium/Germanium measures in 2023 as specifically linked to tech (namely semi-conductors), while we have interpreted the dual-use ban on Tungsten as distinctly military linked.

Interestingly though the most recent USGS Tungsten Review states that import sources (2019–22) for

the US of ores, concentrates, and other forms were: China at 27%; Germany at 12%; Bolivia at 9%; Vietnam at 8%; and others at 44%. In light of rising non-Chinese production, the dual-use ban might only serve to accelerate the erosion of China's market share and thus dominance.

China – All Stick & No Carrot

Just as in Rare Earths and other specialty metals the Chinese government, in the early part of this decade, curtailed mining programs and strongly “encouraged” downstream processing of concentrates to higher value-added products such semi-finished and finished Tungsten products. We might also note that before the 2008 slump China had become a net importer of Tungsten concentrates and scrap.



Source: Roskill

The slightly old chart above is still illustrative of the situation during Tungsten's last run. It shows that China's production peaked in 2011 and then tailed off but then picked up again. *Comme d'habitude*, the extraction quotas that the Chinese imposed were regularly blown out by the producers (legal and illegal) but it was interesting to note how the gap narrowed.

Chinese Dominance – Mission Unaccomplished

There was a brief moment, around 2010, when it looked like all China's grab for the global machine tool market might actually be realised. The strategy was firstly to sink the Tungsten prices and drive the few remaining non-Chinese producers to the wall, then hike the prices, restrict exports, force Western (mainly German or Swedish) players in the tool business to move plants to China or eat their lunch via predatory pricing and global domination of yet another niche would be achieved.

However, the Chinese didn't count on meeting any resistance. As we noted earlier, the Western end-users in the tool space, breaking with orthodoxy, decided to pay more for "secure" Tungsten supplies than the "market" price which the Chinese set.

Nevertheless, the industry thus passed through the eye of the storm and there is now a fairly robust non-Chinese Tungsten mining momentum and the Chinese strategy of machine tool domination came undone.

Chinese Position

China accounts for over 80% of world Tungsten primary (mine) production. Production from sources outside of China is limited, leading to Tungsten being considered a strategic commodity.

However, decades of excessive exploitation of the minerals, and not just in Rare Earths, have greatly damaged the environment. To curb environmental degradation and protect the resources, the country implemented a range of policies, including output caps, stricter emissions standards and a crackdown on illegal mining.

This narrowing was probably due to a measure, taken in early 2011, when China's Ministry of Land and Resources announced that authorities in the country had identified and ordered the clean-up of more than 280 illegal mines in an effort to regulate the exploration of valuable minerals. The number of exploration licenses for minerals such as Rare Earths, Tungsten, Tin, and Antimony were reduced to 116 from 400 in eleven provinces and regions in the country via spot checks led by teams dispatched by the ministry. This campaign has aimed to end the supposedly illegal excavation of valuable minerals. These measures, ostensibly, were in an effort to conserve resources.

China also dominates world consumption, accounting for more than 55% of Tungsten use in 2017. Other major consuming regions and countries are Europe, the USA, Japan and Russia. China has increasingly focused its Tungsten industry on the production of value-added goods such as Tungsten carbide and cemented carbide, not forgetting the somewhat thwarted grab for global machine-tool dominance.

The Thesis

Some would have us believe that Chinese restrictions on its Tungsten industry (concerning mining, exports, foreign investment) brought changes to the global supply pattern. However, our thesis is that Western end-users, having become wary of China-dependence, resolved to pay over the odds to ensure that a non-Chinese source of supply survived to insulate them from eventual predatory pricing.

Strangely though, due to reasons one might only speculate upon, China, in recent times, has become a significant buyer in the West of Tungsten materials to take back for use in China. There is some

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suggestion that their internal costs of production are too high and the (still) low price of Tungsten has provided an incentive to go bargain shopping. This is somewhat ironic in light of the dual-use export ban that the Chinese imposed on Tungsten exports.

APPENDIX II:

Vertically-Integrated Players

Masan High Tech Materials

In June 2020, the Vietnam-based Masan Resources (as it was then) acquired the global Tungsten business platform of H.C. Starck Tungsten GmbH, including high-tech manufacturing plants in Germany, Canada and China. The company then changed its name from Masan Resources Corporation to Masan High-Tech Materials Corporation to reflect its global ambitions.

The acquisition of HCS has enabled vertical integration with Masan High-Tech Materials existing assets: Nui Phao Mining Company and Masan Tungsten Company. The deal added to Masan's product streams, expanding its product mix, technical capability, customer base and geographical reach.

Hot on the heels of the Starck deal, Masan, in October 2020, signed a definitive agreement to establish a strategic alliance in the Tungsten industry with Mitsubishi Materials Corporation with the objective of developing a leading, high-tech Tungsten materials platform.

All this just goes to reinforce the progressive sidelining of China in the Tungsten space, particularly notable because there is no love lost between Vietnam and its northern neighbour.

EQ RESOURCES (EQR.AX) – Rapidly Accreting

We have mentioned EQR in the main body of this report but its recent move into vertical integration is interesting in two ways. Firstly, there is the uniqueness factor for a company amongst the Western universe of Tungsten players to go downstream. Secondly there is the coincidence, or not, of both vertically-integrated players being Vietnam-focused on the industrial side. Anyone would think that China was going to be eclipsed by Vietnam, one of Peking's worst nightmares.

In mid-November of 2024, EQR announced that it had executed a binding Heads of Agreement (HoA) to acquire 100% of the shares in Tungsten Metals Group Limited (a public unlisted company) and its subsidiaries, and, separately, the totality of George Chen's interest in Asia Tungsten Products Co Ltd resulting in EQR obtaining a 100% ownership of what might be called the TMG Group.

TMG Group currently owns and operates the largest ferrotungsten (FeW) plant outside of China with a potential production capacity of 4,000 tpa FeW. The facility is located in Vĩnh Bảo, Haiphong Province, Vietnam, and was built in 2011. In recent years, the facility has mainly operated as a toll treatment

facility for third-party customers, converting primary and secondary tungsten raw materials into high-quality FeW. Due to its scale and favourable cost structure in Vietnam, particularly with regards to electricity usage and cost of labour, the facility is regarded as one of the most competitive in the industry.

The Deal

As per the terms of the HoA, EQR determined that the enterprise value of TMG Group is AUD\$13.5mn million, inclusive of the acquisition Shares (being 100% of TMG shares, plus George Chen's 40% interest in ATC) and inclusive of liabilities as of the date of the HoA. If the conditions are satisfied then EQR will be issuing an estimated 170 million new ordinary EQR shares and make payment of AUD\$2.5mn in cash (intended to be funded through customer prepayments for FeW) while assuming TMG Group's liabilities.

Rationale

According to EQR's management, due to its scale and favourable cost structure, the facility is one of the most competitive in the industry. It should provide EQR with diversification and vertical integration of EQR's upstream operations.

In its release, EQR claimed that FeW pricing dynamics are partly decoupled from the Tungsten concentrate market and ammonium paratungstate (APT) markets, which are currently EQR's main offtake industries. FeW prices over the recent 24 months have outperformed APT prices by approximately 19%.

APPENDIX III:

THE OTHER PLAYERS

Victims & Challengers

In the early 2000's to 2022 the Tungsten price was volatile. The market was dominated by Chinese producers with little to no trade restrictions or tariffs. The source of the supply was not an important consideration during this time period. That has changed dramatically in recent years where some consumers of Tungsten concentrate, and recycled material, have eschewed buying of material from China or sanctioned countries.

Predatory pricing practices by the Chinese (with a goal of "capturing" the machine tool industry for itself) produced a flurry of activity with threatened companies outside of China realizing that they urgently needed to find and secure long-term supply of Tungsten and its products from sources outside China.

This, in turn, led to increased investment in exploration and mine development activities outside of China, particularly in Vietnam, Australia and the Americas. Three former Tungsten mines were reopened: CanTung (owned by North American Tungsten) in Canada in 2005, the aforementioned Panasqueira (which was acquired by Sojitz) in Portugal in 2005 and Pasto Bueno (owned by Malaga Mining) in Peru in 2006.

Tellingly, since that time, North American Tungsten and Malaga went bust and Sojitz sold its Portuguese operation to Almonty Industries (which was run by the management group that had sold the mine to Sojitz previously). Wolf Minerals went bankrupt on its Hemerdon mine in England and then Woulfe Mining followed suit on Sangdong in South Korea.

During the period of market volatility assets were closed or sold. For example, Hemerdon passed to the hands of Tungsten West plc (LSE: TUN) and Sangdong was snapped up by Almonty.

Ormonde Mining came to grief on Saloro in Spain and the asset passed, through private equity hands, to EQ Resources (that has revived Mt Carbine in Queensland) and W Resources plc, holders of the La Parrilla mine in Spain, delisted from the London Stock Exchange, disappearing from sight. Fireweed Metals (TSX-v: FWZ) now holds the Mactung project (straddling the Yukon/NWT border) formerly held by North American Tungsten.

Thor Mining itself is an example of where an asset was passed on in the darkest moments to become the focus of a more determined effort by Guardian Metals.

The Hemerdon mine passed to Tungsten West that then listed on London's AIM market.

FIREWEED METALS (TSX-v: FWZ)

This company might, in a certain light, be seen as the continuation of the old North American Tungsten that came to grief with the last major retreat in Tungsten prices last decade. That company's major producing asset had been the Cantung mine (now closed) that, at 1200 tonnes per day, and with reserves of 0.81% WO₃, was among the highest grade and largest tungsten concentrate producer outside of China.

The focus now is the Mactung mine project in the eastern Yukon. This was seen a decade ago as the follow-on to Cantung but got bogged down in the legal morass of North American Tungsten's demise in 2015, compounded by the torpid Tungsten market and the very sizeable capex on a very isolated project. Interestingly the Government of the Northwest Territories purchased Mactung for CAD\$4.5mn in 2015. Then in 2023, Fireweed purchased the project from the government for CAD\$5mn, plus additional payments totaling CAD\$10mn due upon certain production decisions. This was a rare example of a government making money on a foray into mine ownership.

The company claims that Mactung is the world's largest high-grade Tungsten deposit with Mineral Resources totalling 41.5mn tonnes of Indicated Resource at 0.73% WO₃ and 12.2mn tonnes of Inferred Resource at 0.59% WO₃.

In early December of 2024, the Canadian Minister of Energy & Natural Resources, announced a co-investment with the United States into Fireweed. The company will receive up to CAD\$12.9mn from Natural Resources Canada for its North Canol Infrastructure Improvement Project. These pre-development activities will focus on improvements of approximately 250 kilometres of road, upgrades to an existing transmission line between Faro and Ross River, and the construction of a new transmission line from Ross River to the Macmillan Pass site.

The payment is pending final due diligence, for pre-development activities by the company such as design, studies and collection of baseline data, as well as engagement and consultations with First Nations.

These funds will be joined by a US\$15.8mn co-investment from the United States to advance test work, feasibility studies and other preconstruction activities at the Mactung mine project. The co-investment will be provided by the U.S. Department of Defense through the Defense Production Act Purchases Office.

There does not seem to be a modern capex number. However, we discovered a 2008 capex projection of CAD\$289mn. This would have involved a 2,000 tonne per day mill feed rate over a 20-year mine operating life.

HAPPY CREEK MINERALS (HPY.V)

The 100%-owned, 130 square kilometre Fox Tungsten property has a large scale 10 km by 3 km mineral system with grades that the management claims “are among the best in the industry”. With 582,400 tonnes of 0.826% WO₃ in the Indicated category and 565,400 tonnes of 1.231% WO₃ in the Inferred category, the Fox resource appears to be meaningful.

TUNGSTEN WEST (TUN.L)

The Hemerdon Mine in the south-west of England in Devon is a storied and rather low-grade source of Tungsten. It went spectacularly bust under the stewardship of Wolf Minerals and has now resurfaced under Tungsten West, which floated on London’s AIM market in 2023. The mine has only been closed for a short while and is in the process of reopening under the new owners.

GROUP 6 METALS (G6M.AX)

We covered this project nine years ago when it was in the guise of King Island Scheelite. It is Australia’s most storied Tungsten mine and, some might say, suffers from its unique position on King Island in Bass Strait between Victoria and Tasmania.

Part of the deposit is under the sea and the plan was to build a retaining wall to hold back the sea and permit mining. In July 2023, the company announced that it had achieved commercial production of tungsten concentrate at the Dolphin Tungsten Mine.

The process plant achieved 70% runtime processing in excess of 10,000 tonnes of lower to medium grade ore at an average grade of 0.3% WO₃, which produced approximately ten tonnes of saleable tungsten concentrate in June 2023. Preliminary site assays indicate the concentrate produced has achieved an average grade of 55% WO₃ (and a maximum grade of 68% WO₃).

ALLIED CRITICAL METALS/DEEPROCK

This is an imminent listing via an RTO into the shell-like Deeprock, which is a halted stock on the CSE. There are two main assets in this deal, both brownfields past-producers in northern Portugal.

Borralha Tungsten Project:

- Licensed Exploration Rights Concession; advanced stage brownfield project with updated NI 43-101 Technical Report (effective July 31, 2024) including:
 - Indicated resources: 4.98mn tonnes at avg 0.22% WO₃, 97ppm Sn, 762ppm Cu, and 4.8ppm Ag
 - Inferred resources: 7.01mn tonnes at avg 0.20% WO₃, 83ppm Sn, 642 ppm Cu, and 4.4ppm Ag

- Historic production from 1904-1985 of wolframite concentrate at an av. grade of 66%

Vila Verde Tungsten-Tin Project:

- Licensed Experimental Exploration Rights being converted to Exploration Rights
- Prior production with limited indicative historical resource of 7.3mn tonnes mineralized material with a cut-off of 500 gpt WO₃
- Vila Verde Tungsten Concentrate Pilot Plant – Pre-existing quarry operation capable of near-term cash flow, with construction and commissioning intended for 1H25 with intended non-dilutive project financing, offtake negotiation in process
- quarry permitting would allow for processing 150,000 tpa in Year One increasing to 300,000 tpa in Year Two and beyond

NORTHCLIFF RESOURCES (TSX: NSE)

The Sisson Brook Tungsten-Moly project in New Brunswick was originally proved-up by Geodex Resources (where the author of this report was CEO in the wake of Geodex disposing of the asset via a share distribution). This transaction, however, happened over 10 years ago at the end of Tungsten's last run and Northcliff has been in a holding pattern ever since with this asset.

Northcliff Resources Ltd. holds an 88.5% controlling interest in and is the operator of the project with Todd Corporation of New Zealand holding an 11.5% interest Todd also holds a 81.43% interest in Northcliff.

The 14,140-hectare Sisson property hosts a large, structurally controlled, intrusion-related tungsten-molybdenum deposit, said to be amenable to open pit mining. The Sisson Project Feasibility Study is rather long in the tooth having been released as long ago as January 2013.

PURE TUNGSTEN

This is a private Canadian company that mooted plans to list in 2023 and then start producing in 2024. Its flagship asset is the Bodó Mineração mine that has one of the highest grades in the industry with 1.44% WO₃ and recent "historical" production. It is an underground mine apparently dating back to WW2 and is said to have provided the US with W in its initial years.

The company is pondering shifting to open-pit format and plans to be processing ~150tpd with an initial target of 500 to 1,000 tonnes WO₃ concentrate per annum. As they say in the classics, we shall see.

AMERICAN TUNGSTEN (CSE:TUNG | OTCQB:DEMRF | FSE:RK9)

Another late starter in the Tungsten stakes is American Tungsten Corp. (which changed its name recently from Demesne Resources). This is a Canadian-based company ostensibly involved in the

acquisition and exploration of magnetite mineral properties, namely the Star Project covering an area of approximately 4,615.75 hectares located in the Skeena Mining Division, British Columbia, Canada. This project was not generating any excitement for us or anyone else.

More interesting was when the company entered into an option agreement, under which it can acquire a 100% interest (subject to a 2% royalty) in the IMA Mine project, a past-producing underground Tungsten mine situated on 22 patented claims located in East Central, Idaho in the United States. This looks like something that can more appropriately tick the boxes. Let's see if they are serious in advancing it.

The Tungsten Lifecycle Chart

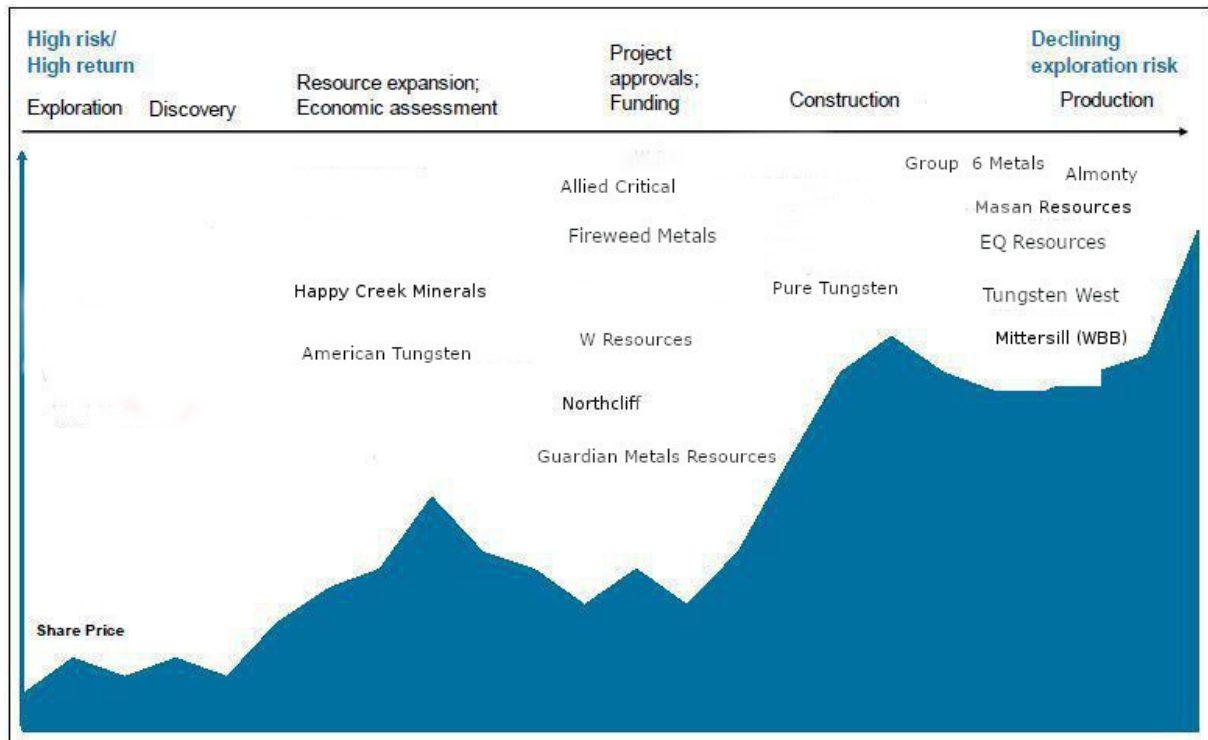
Our all-purpose Lifecycle chart below, serves particularly well, in the case of Tungsten, to show the state of progress of the various players vis-à-vis each other on the exploration-production continuum.

Unlike past charts, where some of the players were not serious about getting to production, the culling of the ranks has left only the most devoted Tungsten players.

Moreover, it is very rare that we end up with so many at the production end of the continuum that we run out of space.

Tungsten West is not exactly producing (today) but can be pretty much turned on (or off) like a light switch. Guardian Metals could be propelled to production more rapidly now that it is acquiring a more advanced (and built) asset. Then there is Allied Critical that claims that its mine is somewhat of a quarry and should be relatively easy to turn on.

W Resources fell off the radar when it delisted but its La Parilla mine could be a "late starter" in the Tungsten Stakes.



There are a number of potential Tungsten wannabes with Brazilian assets, we added the unlisted Pure Tungsten to represent this amorphous category, but should Tungsten surge in price then one should not be surprised to see some of these assets surface in capital markets.

Another country with a past producing history is Argentina.

Conclusion

For the first time since 2010 there now exists a window of opportunity for Tungsten developers to catch the attention of investors, as industrial end-users and the Western military scramble to secure alternative, more reliable sources of supply.

Interestingly, there has been consolidation, with the survivors owning more than one producing asset in some cases. Therefore, investors now have a choice of a handful of Tungsten producer (and developer) stories out there. The push in U.S. reshoring efforts and Tungsten price is relatively recent and therefore has not attracted the typical promotional types of Vancouver or West Perth, as of yet.

Important disclosures

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