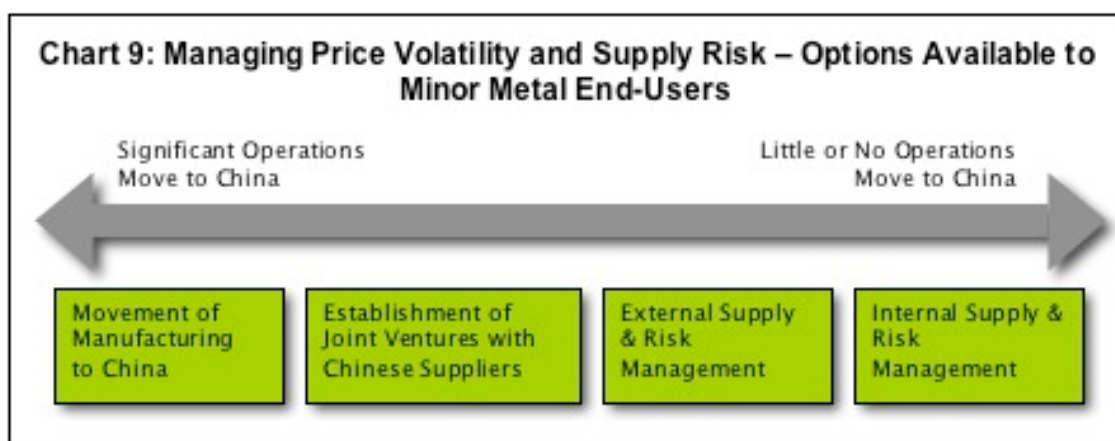


# CHINA'S GROWING ROLE IN THE PRODUCTION & SUPPLY OF MINOR METALS

## PART III: RESPONSES BY INTERNATIONAL MINOR METAL END-USERS [MAY 2010]

Increasing dependence on Chinese minor metal production has forced end-users to consider how best to deal with greater price volatility and a heightened risk of supply disruptions. In part one of our series on the effect of growing dependence on Chinese production and supply of minor metals, we showed that China's share of global production rose 34 percent between 2000 and 2009. In part two, we outlined the key factors in this rise, including natural resource reserves, domestic manufacturing growth, as well as industrial development, environmental and export policies, and concluded that the major impacts on end-users are an increase in price volatility and a greater risk of supply disruptions. In this, the final part, we will discuss the options available to end-users in order to deal with price volatility and risks of supply disruptions.

The four typical responses by international companies to supply and price volatility risks in the minor metal market can be summarized as: (1) Movement of manufacturing to China, (2) establishment of joint ventures (JVs) with Chinese suppliers or producers of primary materials, (3) external supply and risk management, and (4), internal supply and risk management. These four responses can be viewed as a spectrum, ranging from those that result in a large amount of operations moving to China, to those that avoid any operations moving to China.



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### 1. Movement of Manufacturing to China

As discussed in part two, China has been very effective in attracting downstream production of minor metal materials. From the experience of rare earth, tungsten, molybdenum, indium and silicon, in particular, one can clearly see a policy evolution that attracts production and refinement of minor metals to China prior to erecting export barriers (export taxes and quotas on low-value products) and encouraging domestic production of value-added goods. The low cost of labour, an undervalued exchange rate and proximity to one of the world's largest and fastest growing economies makes it difficult for manufacturers to resist moving operations to China. The high-strength magnet industry, as noted in part two, provides an excellent example of this, but there are many other examples, including the nickel-cadmium (NiCd) battery industry.

NiCd batteries are the primary application for cadmium, accounting for about 80 percent of global cadmium use.<sup>i</sup> NiCd rechargeable batteries are widely used in portable electronics and emergency energy units, as well as many other applications, due to their extended storage times, low life cycle cost and deep discharge tolerance. In the 1980s, a significant portion of global NiCd battery production was located in the USA, and by 1994 apparent consumption of cadmium metal in the United States was over 3000 metric tons.<sup>ii</sup> However, concerns about the health effects of cadmium, consequent environment regulations and the development of lithium-ion batteries, led to a significant decrease in the use of NiCd rechargeable batteries in the US market and other western countries. The shrinking western market for NiCd batteries made local production less economical and, as a result, by 2008, apparent consumption in the US had dropped to just 550 metric tons. Global demand for NiCd batteries, and cadmium metal, did not drop as significantly over the same period, as developing economies, particularly in Asia, showed preference toward the more economical NiCd batteries in their manufactures. Attracted by the new market, less restrictive regulations and low labour costs, NiCd battery production began to move to China. This economic shift not only effected US and western producers, but those in Asia as well, as Japanese and Korean battery producers, including Matsushita Electric Industrial Co. Ltd. and Sanyo Electric Corp. Ltd., have reportedly moved manufacturing

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to China in recent years.<sup>iii</sup> By 2007, China was the world's second largest consumer of refined cadmium metal and the largest producer of NiCd batteries.<sup>iv</sup> Unlike the rare earth magnet example, this industry shift was not directly related to raw material access and protective export policies, but due to a geographical change in demand, labour costs and environmental regulations.

Companies that have chosen to move manufacturing to China have traditionally not been those whose comparative advantage stems from proprietary technology, but those that rely on production cost advantages to produce returns. However, as China produces a greater share of many minor metals, while increasingly restricting the export of these metals, this may change, as manufacturers are forced to work with Chinese metal producers to ensure a reliable supply of materials.

### 2. Establishment of Joint Ventures with Chinese Suppliers

JV arrangements can take many forms and serve many purposes, from attempting to capture synergies in product development or benefits from economies of scale, to efforts at gaining market access through pre-established local brands. In this context, we refer to JVs that seek to benefit from reducing risk of supply interruptions when sourcing minor metals from China. AXT Inc.'s supply agreements with Chinese suppliers provides a good example of this. Headquartered in Fremont California, AXT Inc., designs, manufactures and distributes semiconductor substrates, such as gallium arsenide and indium phosphide. Today, AXT Inc. has five joint ventures that provide a reliable supply of high purity gallium, germanium and arsenic, as well as crucibles and other related parts. The AXT website succinctly explains the purpose of these JVs:

As the raw materials required by our compound semiconductor substrates play such an essential role in our growth and reproducibility, we participate in joint ventures with five Chinese companies. Through them, we manufacture and sell critical materials... This arrangement reduces our dependency on other suppliers of raw materials, plus it affords us price and volume stability unavailable to those purchasing on the open market.<sup>v</sup>

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Such JV arrangements are likely to become more and more common as China continues to limit the export of refined metals that are critical to many industries. However, not all minor metal end-users consume quantities large enough to justify moving part of their operations overseas or establishing a JV. These companies may look to work with trading companies that are more familiar with the market to provide guidance.

### 3. External Supply Risk Management

External supply risk management is an effective method of managing supply risk and price volatility for companies of all sizes. Companies that purchase relatively small quantities of minor metals can benefit from the prices that metal trading companies are able to access through bulk purchases, as well as the resources and abilities that these companies have in sourcing materials when export limitations restrict access. For medium and large end-users, external management can often be more cost effective than employing a full-time purchasing manager and, depending on the capabilities of the trading company, may result in beneficial pricing and greater supply assurance. Compared with internal supply management and sourcing, external sourcing management also allows end-users to reduce the amount of capital tied up in volatile assets.

External supply risk management refers to only those metal trading and sourcing companies that are actively involved in monitoring minor metal markets and strategically purchasing materials in order to reduce price and supply risks for their clients. Metal trading companies that do not actively monitor markets and employ strategic purchasing and warehousing techniques on behalf of their clients should not be considered risk managers due to the fact that, by purchasing and selling at spot prices, all the price volatility and supply risks are passed on to end-users. A simple example shows the potential cost of purchasing at spot prices, whether from metal traders or directly from producers, as opposed to utilizing a risk management trading company, such as Strategic Metal Investments Ltd.: If a hypothetical photovoltaic cell

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producer, ABC Co., made four equal germanium dioxide purchases of 25kgs during 2007, one in each season, the total cost to ABC Co. would have been US\$ 69,375, as shown in Table 4. However, an experienced minor metal risk management partner that understands the supply and demand dynamics for germanium would have acted with more foresight in a rising price environment, discussed expected supply requirements with ABC Co., and advance purchased material so as to provide a more competitive price to its client.

Supplier	Jan. 2007 (25kg order)	April 2007 (25kg order)	Aug. 2007 (25kg order)	Dec. 2007 (25kg order)	Total Cost to ABC Co.
Spot Market Trader	\$625/kg (\$15,625)	\$650/kg (\$16,250)	\$700/kg (\$17,500)	\$800/kg (\$20,000)	\$69,375
Price & Risk Management Trader	\$650/kg (\$16,250)	\$650/kg (\$16,250)	\$665/kg (16,625)	\$680/kg (\$17,000)	\$66,125

The cost savings to our hypothetical germanium dioxide purchaser, ABC Co., are significant, adding up to US\$ 3,250 in one year. In a falling price environment, price volatility and risk management traders should be able to provide clients with prices at, or very near, spot prices, thereby averting any extra costs to clients.

SMI Ltd.'s metal trading operations are not only involved in trading high purity metals, but also provide supply risk management services by monitoring the minor metal market and keeping strategic inventories of metals. We work with our clients to determine annual requirements and stock inventories accordingly in order to reduce lead times, price volatility and the risk of supply shortages. In order to provide clients with the most competitive pricing and a delivery schedule that suits clients' needs, SMI Ltd. offers shipping direct to clients from both its Asian and North American warehouses. Whereas many metal traders simply look to

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capitalize on the price volatility of minor metals, SMI Ltd. works with clients to find supply solutions that are best for their particular situation. Our supply management office in Beijing monitors production, inventory and market trends on behalf of our clients in order to further help identify issues that may impact markets and supplies. We communicate this information on to clients in order for them to make timely and knowledgeable decisions.

### 4. Internal Supply Risk Management

Internal supply risk management refers to minor metal end-users that choose to employ an individual to monitor markets and manage inventories to determine when to purchase and then negotiate pricing and terms. This role often falls to a company's purchasing manager, however, many large minor metal end-users, whether producing steel or semiconductors, often employ a specialized purchasing manager for minor metals due to the time and knowledge requirements of sourcing from China. Internal supply risk management is only cost-effective for those end-users purchasing significant quantities of minor metals, as the cost savings provided by their market knowledge, contacts and negotiations must justify the additional salary and related expenses. Small and medium-sized consumers often forego minor metal price and supply risk management, instead choosing to purchase at spot prices. However, many do practice various forms of strategic purchasing in an attempt to avoid supply shortages and capitalize on bulk pricing. But without a full-time staff dedicated to market analysis and local contacts monitoring metal inventories and prices, these companies often find themselves with either too much capital tied up in inventory or seeking alternate sources when supply disruptions leave their spot trader unable to source material. Such companies would likely benefit from partnering with a professional minor metal supply risk management company.

### Other Factors Influencing Minor Metal Sourcing Options:

Two factors that have significantly influenced minor metal supplies and purchasing practices over the past decade are worthy of note here; These are the growth of minor metal recycling and the introduction of minor

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metals (i.e. molybdenum and cobalt) to the London Metal Exchange (LME). A third factor to consider, that may become more influential in the coming ten years, is an increased involvement by western end-users in supporting non-Chinese supply sources.

### Minor Metal Recycling

During the past decade, the demand for many minor metals has increased significantly. This increased demand, along with limited primary production and advances in metal recycling efficiency, has resulted in recycled minor metal production becoming an important source for minor metal end-users. Over 20 percent of global cobalt, gallium, germanium, indium and tungsten metal now comes from secondary, or recycled, production. Recycled metals not only benefit end-users by increasing supply capacity, but also help to decrease price and supply risks by reducing supply concentration. This is because recycled metal producers are not as limited by geographical – and geological – considerations as primary producers. In theory, minor metal recycling companies possess an advantage over primary producers by being able to economically locate themselves closer to their end-users, who also act as their suppliers, in terms of scrap and spent material. The location of primary production facilities, in contrast, must take into consideration their proximity to raw materials (ores and concentrates). In many ways, minor metal recycling has become the western production response to China's increasing primary production. This will issue is critical to understanding the supply dynamics of many minor metals and will be the topic of a forthcoming report by SMI Ltd.

### The Introduction of Molybdenum and Cobalt Futures Trading on the London Metal Exchange

Molybdenum and cobalt began trading futures contracts on the LME in February of 2010. Futures contracts provide a number of benefits not afforded to most minor metals, which can be used in order to manage price risks. The ability to hedge futures contracts now allows end-users of molybdenum and cobalt to off-set potentially large losses due to price volatility, while the consequent price transparency allows traders to offer

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## PART III: RESPONSES BY INTERNATIONAL MINOR METAL END-USERS [MAY 2010]

long-term fixed price sales contracts. The result is more options for end-users to manage price risk and, therefore, more accurately forecast budgets.

Although futures contracts for most minor metals will not likely be available anytime soon, full service minor metal risk management trading companies, like SMI Ltd., offer a variety of purchase contract options to clients in order to most effectively deal with price and supply risks.

### Support for Alternate Primary Production

One interesting development that has resulted from concerns over China's rare earth production control is the increase in support from end-users for non-Chinese primary producers. Support for alternate primary supply sources is, by no means, a new phenomenon; however, the support for western rare earth production has taken a particularly nationalistic tone in the US, with many comparisons being drawn between dependence on oil from the Middle East and rare earth from China. Large international end-users, such as Rhodia, have not surprisingly been at the forefront in negotiating supply contracts with potential non-Chinese producers like Lynas Corp., the two of which have already inked a ten-year supply contract for rare earth materials. Should China continue to enact restrictive export policies for its growing share of global minor metal production, it is safe to expect more support and involvement from large end-users in developing non-Chinese supply.

The effect of China's increasing share of global minor metal production has already had profound effects on the industry. International end-users have been forced to consider whether to move manufacturing overseas, set-up joint ventures with Chinese suppliers or employ risk management services to deal with increasing price volatility and supply disruption risks. The growth of metal recycling has helped limit the dependence on Chinese supplies of some minor metals, but further concentration is, nevertheless, still expected. This, in combination with greater export restrictions, will likely lead to more trade disputes between China and the West, as well as greater involvement by major international end-users in developing on-Chinese production.

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<sup>i</sup> International Cadmium Association (2003) <[www.cadmium.org](http://www.cadmium.org)>

<sup>ii</sup> Apparent consumption is defined as domestic production plus imports, minus export.

<sup>iii</sup> USGS (2007). Minerals Yearbook: Cadmium

<sup>iv</sup> USGS (2007). Minerals Yearbook: Cadmium

<sup>v</sup> AXT Inc. Profile & Philosophy. <[www.axt.com](http://www.axt.com)>

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