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PROCESSING POWER:

A Western Smelter for Sovereignty and Energy Security

Bentley Allan | Phillip Mackey | Sosthène Ung

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About the Authors

Bentley Allan

Bentley Allan, PhD, is Vice President, Future Economy and a Transition Pathway Principal at the Transition Accelerator, and an Associate Professor of Political Science at Johns Hopkins University. He leads the Accelerator's work on critical minerals and battery value chains, including major reports such as *A Roadmap for Canada's Battery Value Chain* (2022), *Electrons, Rocks, and Brains* (2024), *Getting Prices Right* (2024), and *Catalyzing Demand* (2025), and has contributed to *From Rocks to Power* and *Towards a Western Canadian Battery Value Chain*. An award-winning scholar specializing in geopolitics, industrial strategy, and the political economy of decarbonization, Dr. Allan advises governments and industry and co-coordinates the Centre for Industrial Policy to strengthen Canada's capacity in modern industrial policy and strategic collaboration.

Philip Mackey

Phillip Mackey, PhD, is a distinguished metallurgist in non-ferrous extractive metallurgy and a member of the Canadian Mining Hall of Fame. After earning his BSc (Hons.) and PhD from the University of New South Wales, he joined Noranda in Montreal, where he helped develop the Noranda Process in the 1970s, the world's first continuous copper smelting process, and later co-invented the Noranda Converting Process. These technologies remain in operation at Canada's only remaining copper smelter. Over his career, Dr. Mackey has also contributed extensively to the processing of lateritic nickel and to advancing energy efficiency and low-carbon approaches in metals production. A Past President of the Metallurgical Society and a Fellow of CIM and TMS, he has received numerous distinctions, including the CIM Silver Medal, the Selwyn G. Blaylock Medal, and other major awards recognizing his outstanding contributions to extractive metallurgy.

Sosthène Ung

Sosthène Ung, PhD, is a Future Economy Lead specializing in critical minerals at the Transition Accelerator. He holds an MSc in organic chemistry and a degree in chemical engineering from Montpellier, France, and earned a PhD in green chemistry from McGill University in 2022. His work focuses on strengthening Canada's critical minerals value chains, including upstream mining, midstream processing, and strategic material manufacturing. He is the author of two major reports, *From Rocks to Power* and *Towards a Western Canadian Battery Value Chain*, which examine pathways to build integrated, competitive, and resilient mineral processing capacity in Canada. In 2025, he co-authored strategic and policy recommendations on interprovincial collaboration for critical minerals value chains for Canada's Energy and Mines Ministers' Conference (EMMC).

The following brief was prepared by the Transition Accelerator with the generous guidance and technical expertise of metallurgist Philip Mackey, head of P.J. Mackey Technology Inc.

About The Transition Accelerator

Our Objective

The energy transition is disrupting global power. The Transition Accelerator is here to help Canada win — **economically** and **geopolitically**.

Our Work

The Transition Accelerator drives projects, partnerships, and strategies to ensure Canada is competitive in a carbon-neutral world. We're harnessing the global shift towards clean growth to secure permanent jobs, abundant energy, and strong regional economies across the country.

We work with 300+ partner organizations to build out pathways to a prosperous low-carbon economy and avoid costly dead-ends along the way. By connecting systems-level thinking with real-world analysis, we're enabling a more affordable, competitive, and resilient future for all Canadians.

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- We understand the current system in practice, not just in theory, identifying barriers to innovation and opportunities for change.
- We bring together industry, labour, government, Indigenous and other leaders to define shared visions of success for their sectors, regions, or communities.
- We mobilize partners to develop pathways to get there, understanding and refining them to ensure they are credible, capable, and compelling.
- We turn ideas into action and take steps down those pathways by launching projects and partnerships to build a more competitive future.

For more information or interview opportunities please contact
communications@transitionaccelerator.ca

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To counter Chinese capacity-driven squeezes in global processing fees, Canada must deploy efficient policy instruments that provide demand-side certainty for processing.

1. EXECUTIVE SUMMARY

Canada needs a Western copper smelter to bolster its critical minerals capabilities as the country seeks to build geopolitical leverage and secure its autonomy. Copper smelting and refining represent a key node in supply chains for the electricity grid, defence, and electric vehicles. However, smelters across the Western world are facing economic headwinds driven by China's efforts to control midstream metallurgy, which are squeezing processing and refining charges. Pressure on non-Chinese smelters risks concentrating copper processing and threatening supply chains for strategic sectors.

Canada currently exports copper concentrates from B.C. to China. Processing that ore at home would capture value-added, meet growing global demand, and create supply chain resilience for multiple metals beyond copper. A Western smelter can co-locate processing for other significant critical minerals in the region, such as nickel, rare-earth elements, phosphate, and battery recycling. A Western Canadian smelter is thus both an industrial opportunity and a vital tool for building resilience and independence in a dangerous world.

This brief outlines the **opportunity for a modern Western Canadian copper smelter** located at a strategic industrial hub, such as a B.C. coastal port or the Edmonton region, to optimize access to domestic and international feedstock. Key features of the proposed facility include:

- **Operational Flexibility:** While primarily processing copper concentrates in its early years, the facility would be designed to increase the intake of scrap over time.
- **Proven and Safe Technology:** Adopting advanced processes and operations such as modern European smelters, the smelter would integrate high-efficiency emissions controls, capture sulphur dioxide as marketable sulphuric acid, and safely manage residuals like arsenic and slag.

- **Industrial Synergies:** The design could anchor a metallurgical hub, enabling the co-location of midstream processing for nickel leaching, rare-earth separation, phosphoric acid production, or battery recycling.

There is a public perception that a smelter would be dirty. Based on technology common in Western Europe, a modern smelter can have full environmental controls, giving it a comparable environmental risk to other industrial facilities and be safely located in reasonable proximity to urban areas. The Harjavalta facility, for example, is located just 30 km east of Pori, Finland.

Canada must act decisively. To counter Chinese capacity-driven squeezes in global processing fees, Canada must deploy efficient policy instruments that provide demand-side certainty for processing.

Following the MP Materials deal in the U.S., Canada successfully used a **Contract for Difference** (CfD) in the Nouveau Monde Graphite deal. This offtake guarantees a floor price while allowing the government to capture 50% of any upside if prices rise above the strike, providing certainty without direct subsidies or stockpiling.

The CfD is the right mechanism to secure both Canadian extraction and processing. We propose a Nouveau Monde-like offtake that specifies treatment and refining charges (TC/RC) for the Western smelter in advance. This would bridge the gap between economic Western charges and the artificially low rates offered in China. By writing the smelter into mining offtakes, Canada can stabilize processing costs for domestic mines and build a resilient supply chain for copper and defence-critical metals.

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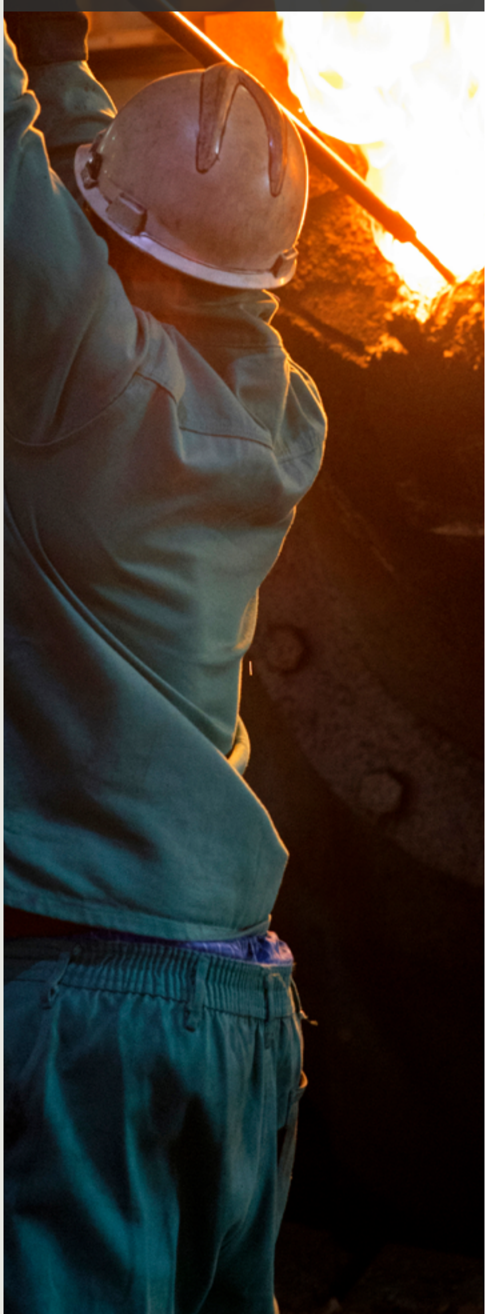

2. DOMESTIC COPPER OPPORTUNITIES

Copper is a foundational material for electrification across power systems, transportation and digital infrastructure, so processing capacity is increasingly intertwined with energy security.

Copper processing has a long history in Western Canada, dating back to early 20th-century smelters in the Trail region and Southern B.C. By the early 2000s, Canada operated three primary operations: Kidd Creek (Ontario), Flin Flon (Manitoba), and Rouyn-Noranda (Quebec). After the Ontario and Manitoba sites closed, Glencore's Horne Smelter in Quebec became Canada's last active copper metallurgical facility, alongside the CCR refinery in Montreal. However, the Horne Smelter currently requires significant upgrades to meet European plants' environmental and operational standards.

In 2024, seven of B.C.'s largest metal mines produced approximately **268,000 tonnes of copper** contained in concentrates. This output exceeds the 180,000-tonne annual feed required to make a local smelter viable. These operations include (**Table 1**):

- **Primary Copper Producers:** Copper Mountain, Highland Valley Copper & Gibraltar.
- **Copper-Gold Mines:** New Afton, Mount Polley, Mount Milligan, and Red Chris.

Regardless of the copper concentrate composition, a copper smelter combined with a copper refinery capable of refining precious metals would capture most of the mineral value currently extracted from B.C. Currently, most copper concentrate is sent to smelters in Asia.

Table 1 *2024 B.C. production of copper*

MINE[A]	OPERATOR	PRODUCT	2024 CU CONTAINED IN CONCENTRATE (T)[B]
Copper Mountain	Hudbay Minerals Inc.	Copper Concentrate	26,406
New Afton	New Gold Inc.	Copper Concentrate	24,494
Highland Valley	Teck Resources Ltd	Copper Concentrate, Molybdenum Concentrate	102,400
Mount Polley	Imperial Metals Corp.	Copper Concentrate	16,193
Gibraltar[c]	Taseko Mines Ltd	Copper Concentrate, Molybdenum Concentrate, Copper Cathode	48,080
Mount Milligan	Centerra Gold Inc.	Copper Concentrate	24,494
Red Chris	Newmont Corp./ Imperial Metals Corp.	Copper Concentrate	26,308
Brucejack	Newmont Corporation	Doré, Gold-Silver Concentrate	/
Total B.C. 2024 Cu production in concentrate (t)			**268,375**

[a] *Blackwater EP2 or Mustang gold mines were not included as they started production in 2025. Only base and precious metals mines were accounted for; industrial minerals, coal mines and quarries were not included.*

[b] *Data gathered from various 2025 corporate documents, production results, and annual filings. Data was converted in tonne.*

[c] *Gibraltar also produces a small amount of copper cathode from copper oxide through its SX/EW plant. This was not included.*

Additionally, among 29 advanced metal mining projects analyzed across B.C. and Yukon, 18 would produce copper concentrates with varying levels of gold and silver credits, which could be a future opportunity to feed a copper smelter. Nine of those 18 are already at the pre-feasibility or feasibility study stage.

By emulating high-efficiency European plants, a new smelter would achieve superior productivity while meeting strict environmental standards.

3. THE COPPER PROCESSING STRATEGY

3.1 Pyrometallurgy Over Hydrometallurgy

A modern Canadian metallurgical plant should utilize the **pyrometallurgical route** (smelting). Unlike hydrometallurgical plants, which require processes tailored to specific mine mineralogy, a smelter can flexibly treat diverse feedstocks from various sources.

This flexibility enables the economies of scale necessary for viability, estimated at **180–250 ktpa** of copper production. By emulating high-efficiency European plants, a new smelter would achieve superior productivity while meeting strict environmental standards. See, for instance:

- The Hamburg smelter by Aurubis in Germany (Figure 1)
- The Huelva Metallurgical Complex by Atlantic Copper in Spain
- The Harjavalta smelter by Boliden in Finland (Figure 2)
- The Rönnskär smelter by Boliden in Sweden

Figure 1 *Google Earth view of the Aurubis Copper Smelter/Refinery in Germany with the city of Hamburg in the Background (1.9M city inhabitants)*

Figure 2 *Harjavalta Copper-Nickel smelter/refinery in Finland, 30 km East of Pori (83,000 inhabitants). Photo: Suurteollisuuspuisto*

3.2 The Limits of Hydrometallurgy

While copper oxide ores (20% of global production) are easily treated via mine-site leaching, as at Taseko's Florence project or as a marginal part of Gibraltar's mine output, this method is rarely viable for the copper sulphide deposits that dominate in B.C. and Yukon.

Hydrometallurgical routes for sulphides are typically constrained by mineral-specific requirements, necessitating a process tailored to a single mine's composition. This lack of flexibility makes them less economically viable than smelting. Despite various patented technologies, such as Teck's CESL process, only one commercial sulphide leaching plant exists: the Bagdad facility in Arizona, developed in the 2000s by Phelps Dodge and now operated by Freeport-McMoran. However, that plant has faced multiple shutdowns and remains restricted to processing feed from a single source.

3.3 The Choice of Smelting Technology

To ensure efficiency and feedstock flexibility, specifically for recycling copper scrap, the choice of furnaces and converters is critical. Most processes allow scrap addition only in later stages, such as in the converter or anode furnace. While adding scrap during early metallurgical stages is more challenging, a conventional Peirce-Smith converter typically allows for higher recycling intake than other converter types.

The following copper smelting technologies are ranked by their probability of implementation in Western Canada:

- **Flash Furnace + Conventional Converter:** This method would allow the largest amount of copper scrap to be charged into the converter. Such a converter is very robust with respect to feedstock but operates in batch cycles.

- **Flash Furnace + Flash Converter:** Because flash converters require fine particles as feed, this technology is incompatible with the intake of copper scrap. However, a flash converter can operate continuously and is quite energy- and gas-efficient, but it is more sensitive to feedstock.
- **ISAsmelt/Sirosmelt/Ausmelt + Regular Converter:** This technology, also known as top-submerged lance smelting, was originally developed by CSIRO (an Australian government research organization) as Sirosmelt and licensed to Glencore as ISAsmelt or to Outotec as Ausmelt. It is a family of technologies that can deliver good output per dollar of capital and is suitable for some copper scrap intake.
- **Electric Furnace:** Historically, electric smelting was a less energy-efficient alternative to reverberatory and blast furnaces. A classic early 20th-century example is the Imatra smelter in Finland, while the Miami smelter in Arizona also integrated electric furnaces. Both sites relied on proximity to hydroelectric or abundant power to be viable. Without such inexpensive electricity, modern plants prefer using tonnage oxygen and the fuel value of sulphide concentrates, which offer significantly higher efficiency.

3.4 Recycling Scrap

Beyond process choice and circularity, smelting copper scrap is only attractive if sourced from a shipping distance that is economically viable. Domestic or locally collected scrap is therefore required. Additionally, scrap is less directly exposed to the TC/RC mechanism and fluctuation, which can add flexibility to smelter economic and pricing models.

However, a new smelter in Canada would face stiff competition for this scrap from established U.S. smelters, including primary American smelters and specifically designed secondary smelters, such as the newly opened Aurubis recycling smelter in Georgia **(Table 2)**. According to the 2026 U.S. Geological Survey, the U.S. is home to two primary copper smelters, two secondary smelters, two primary electrolytic refineries, 14 electrowon refineries, and four secondary refineries.

Table 2 *New U.S. copper scrap plant (secondary smelter), commenced in 2025*

ITEM	DATA
Location	Georgia, USA
Capacity	80 ktpa Cu (Phase 1 & Phase 2)
Feed	Copper and e-scrap
Technology	Modern Technology
Feed Material	~200,000 t/a
Comments	New copper and e-scrap plant in the USA operated by Aurubis

Consequently, a Western Canadian smelter would likely start with scrap representing only 5% of its total feedstock, compared to the 14% currently processed at the Horne Smelter. However, selecting a technology that supports higher scrap intake would provide valuable long-term flexibility as market conditions evolve.

3.5 New Smelter Location

Domestic concentrates from B.C. and Yukon should be the primary feedstock, but transport flexibility is vital. A location at a **tidewater port** would facilitate importing foreign concentrates, the arrival of shipped Yukon concentrates, and exporting products/byproducts, making coastal B.C. the strongest prospect.

While **Kitimat** and **Prince Rupert** offer established industrial infrastructure and harbour capacity, the **Port of Stewart** is another possible but less likely candidate due to limited land and narrow shipping channels. A coastal location ensures a more versatile operation with lower logistics costs.

A coastal smelter provides strategic access to **South American concentrates**, particularly from Chile and Peru (the world's 1st and 3rd largest producers). These nations produce a surplus of concentrate that exceeds their local smelting capacity.

This also creates a reciprocal trade opportunity: B.C. could export its **sulphuric acid** by-product to Chile for use in copper oxide leaching. Currently, Chile depends heavily on imports from China; this trade flow is so significant that it accounts for nearly half of China's total sulphuric acid exports. The recent war in Iran has prompted China to reduce its acid exports, making a diversified acid supply a new geopolitical imperative.

Accessing **U.S. concentrates** is unlikely due to their existing domestic network, while Australian and Indonesian supplies are typically absorbed by Southeast Asian smelters.

In contrast, **inland smelters** are inherently more vulnerable; relying on local feedstock can lead to a loss of competitiveness if neighbouring mines close down, as seen with the Kidd Creek, Flin Flon, and Thompson smelters. While the inland Horne smelter has maintained operations by diversifying its technology and feedstock, it still requires significant upgrades.

If a coastal B.C. location is not feasible, the **Edmonton area** serves as a strong inland alternative. Alberta's industrial sector offers robust infrastructure, a solid social license to operate, and reliable access to natural gas.

A significant advantage is the region's mature oxygen production capacity, supported by established providers like Air Liquide and Linde. While a new smelter would require its own air separation unit, these existing assets and skilled workforce prove the region's technical capability. Furthermore, clustering with existing operations, such as Sherritt's nickel plant and Fortune Minerals' projected facility (copper-bismuth-gold-cobalt), would create a dynamic metallurgical hub that is attractive to skilled labour. However, Edmonton still faces structural hurdles:

- **Logistics:** Maintaining low transport costs for feedstock and products moving to and from B.C. ports.
- **Sustainability:** Addressing Alberta's carbon-intensive grid, as a high carbon footprint could deter ESG-conscious investors.

Alternatively, **Trail, B.C.**, is a potential candidate because it hosts Teck's existing zinc and lead smelter and is near hydroelectric dams. However, securing sufficient land and upgrading transport infrastructure might be challenging.

Like the Edmonton option, Trail's inland location makes transporting concentrates and finished copper cathodes to the Port of Vancouver more difficult and costly than for a direct-to-tidewater coastal operation, but the region is closer to the coast.

3.6 Electrolytic Refining

Electrolytic refining can occur **on-site** or at a **separate facility**. While Canada's Horne Smelter and Montreal CCR refinery are geographically split for historical reasons, the four modern European plants mentioned above typically co-locate both.

Because the price and availability of electricity are vital to a copper refinery, refining is energy intensive. B.C.'s hydroelectric grid, providing capacity, would have a clear advantage over Alberta in building a copper refinery. While Alberta could host a standalone smelter, B.C. is better positioned to host a fully integrated smelter-refinery complex.

Beyond copper, an integrated refinery captures significant additional value by processing mine byproducts into:

- **Precious Metals:** Gold and silver (as doré) and platinum group metals.
- **Critical Minerals:** Tellurium and selenium.

Because many active and projected mines in the region produce copper concentrates with precious metal credits, capturing these materials locally would maximize the economic value of Western Canadian ores and could catalyze the growth of new downstream industries.

Global sulphuric acid supply relies heavily on oil and gas desulphurization and is projected to decline as the world decarbonizes. Acid produced by copper smelters could increasingly become a strategic asset for industrial resilience.

4. ENERGY, MATERIAL FLOWS, AND BYPRODUCT STRATEGY

4.1 Inputs/Outputs & Energy Requirements

Focusing strictly on the smelting and converting stages, and putting aside refining, the process requires copper concentrate, flux, electricity, and a small amount of fossil fuels (usually natural gas). The primary outputs are copper anodes, sulphuric acid, slag, and GHG emissions.

A 2010 publication by Pascal Coursol and Philip Mackey details the energy consumption of four main types of copper smelters. On average, **around 75% of a smelter's energy needs are electrical**, while the remaining 25% comes from fossil fuels. The majority of this electricity is used to power oxygen production (via air separation units) and sulphuric acid plants. Additionally, some processes require significant power for high-pressure air blowing.

Table 3 *Comparison of energy needed per tonne of copper anode produced along four main copper smelter technologies*

	ENERGY NEEDED PER TONNE OF COPPER ANODE PRODUCED			
SMELTING TECHNOLOGY	**Electric Energy** (in kWh)	**Electric Energy**[a] (converted to MJ)	**Fossil Fuel energy** (MJ)	**Total energy** (MJ)
Flash Smelter + Flash Converter	979	9,266	1,518	10,784
ISAsmelt + PS Converter	729	6,903	4,175	11,078
Mitsubishi Continuous Smelting & Converting	898	8,508	2,498	11,006
Noranda/El Teniente + PS Converter	1,065	10,088	2,658	12,746

[a] *Electrical energy computed on the basis of generation in a fuel-fired power plant with a conversion efficiency of 38%*

The role of fossil fuels is mainly to provide supplementary heat to the plant. Most heat is generated by the autogenous oxidation of the sulphur contained in the concentrate. However, some final steps, such as the anode furnace, require relatively small quantities of natural gas as a supplementary heat source.

A 2021 publication also compares environmental performance by conducting a life-cycle assessment of several modern copper smelting technologies. All modern technologies compare very well.

4.2 Deleterious Minor Elements

Copper concentrates can contain a range of deleterious minor elements, such as arsenic and bismuth; the particular element and level can vary from one mine to another. Modern smelters capture, stabilize, and safely handle such elements using up-to-date technology. For example, Dundee Technologies, located in Thetford Mines, QC, has developed the GlassLock technology to vitrify and stabilize arsenic. Modern European copper smelter plants have extremely low to negligible emissions.

4.3 Sulphuric Acid Byproduct

Sulphur dioxide gas emitted during smelting is captured at over 99.95% efficiency and converted into sulphuric acid. This byproduct is then sold into several key industrial markets:

- Fertilizers: The primary market, specifically for producing ammonium sulphate.
- Pulp and Paper: Used extensively in pulp mill processing.
- Steel: Required for “pickling” operations to remove impurities from steel surfaces.

Global sulphuric acid supply relies heavily on oil and gas desulphurization and is projected to decline as the world decarbonizes. Recent geopolitical instability, specifically the conflict in Iran and the blockage of the Strait of Hormuz, has disrupted shipments from the Persian Gulf. Coupled with resulting Chinese export controls, these events underscore the urgent need to diversify supply beyond Western Asia and China. Consequently, acid produced by copper smelters could increasingly become a strategic asset for industrial resilience.

4.4 Critical Mineral Hub Development Around a Copper Smelter

Besides these common industrial applications, a Western copper smelter's sulphuric acid production could anchor **a hub for critical mineral processing**, catalyzing several spin-off industries:

- **Nickel Sulphide:** A hydrometallurgical pressure-leaching plant (similar to Vale's Long Harbour facility) could process concentrates from regional sources like the Turnagain project in northern B.C.
- **Nickel Awaruite:** Concentrates from the Decar region (e.g., the Baptiste project) can be leached to produce nickel sulphate, a vital precursor for battery cathode materials.
- **REE Separation:** Rare-earth concentrates, such as those from B.C.'s Wicheeda deposit, require sulphuric acid for effective processing and element separation.
- **Phosphate:** Sedimentary deposits in the Fernie area could be upgraded into phosphoric acid using the "wet process" route, which relies heavily on sulphuric acid.
- **Battery Recycling:** The hydrometallurgical treatment of black mass (shredded battery waste) uses sulphuric acid to extract graphite and high-value metals. Co-locating a recycling plant with a smelter would create a closed-loop battery material ecosystem.

Canada has created a demand-side instrument that de-risks private investment in critical minerals without requiring public ownership of the commodity.

5. PRICING & POLICY RECOMMENDATIONS

5.1 Copper Concentrate Contracts

Copper **concentrate contracts** are established between the miner and the smelter/refinery. These agreements typically begin by calculating the total payable metals and the percentages of contained copper, gold, and silver (above minimum thresholds) for which the smelter will pay.

Valuation is linked to major indices such as the **LME** and **COMEX**. Alternatively, in some arrangements, the smelter returns the agreed quantities of refined accountable metals rather than providing a cash payment.

For copper, depending, payment is typically 96.5–96.75% of the contained metal. Miners also receive “credits” paid for precious metals such as gold and silver, provided they exceed the negotiated minimum thresholds. Conversely, penalties are applied and deducted if deleterious elements like arsenic or bismuth are present at certain levels.

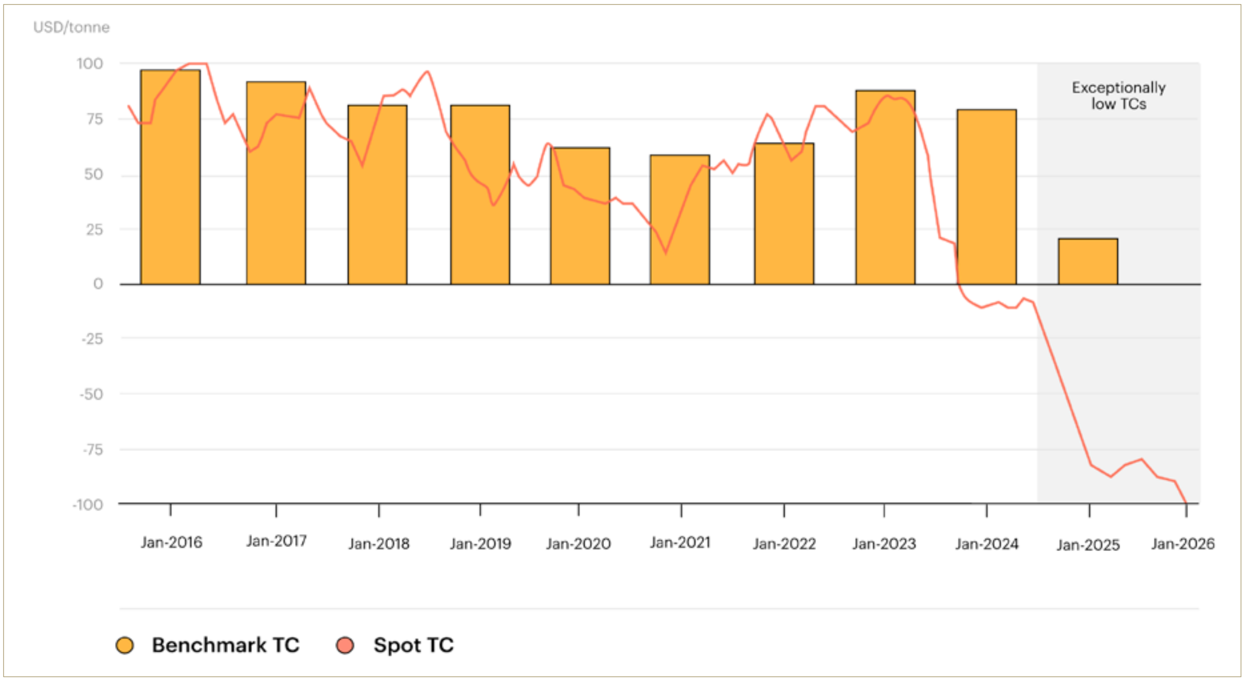

Figure 3 *Evolution of Benchmark and Spot copper TC from 2016 to 2026. Source: IEA.*

To cover the costs of processing, the smelter deducts **Treatment Charges** (TC) and **Refining Charges** (RC) from the total payable value (**Figure 3**):

- **TC/RC Benchmarks:** These commercial terms are typically negotiated annually.
- **Spot Terms:** These rates are more volatile and are negotiated periodically based on current market fluctuations.

Together, these deductions represent the market-negotiated fees for converting raw concentrate into high-purity refined metal.

The final invoice value reflects the total payable metals minus these deductions. Separately, the cost of delivery can be covered by the miner or smelter, depending on contracting terms, but freight charges and insurance are usually paid by the shipper.

Once refined, copper is sold at the indexed LME price (typically the monthly average) plus a regional premium reflecting local market conditions and logistics.

The high concentration of smelting capacity in Asia, particularly China, has driven Treatment and Refining Charges (TC/RC) to historic lows. Broad consensus expects those low fees to persist into the medium term, heightening the importance of policy tools that stabilize TC/RC exposure for non-Chinese projects. This, despite copper prices reaching record highs, has made many **Western smelting projects economically difficult** to justify.

Regarding copper prices, they would still need to rise, as a new 2026 study by the University of Michigan indicates that the "price for copper needs to at least double in order to incentivize mining companies to pursue new mines." In light of this, ensuring a stable copper price and TC/RCs would be a necessary and valuable policy tool.

5.2 Policy Mechanisms Needed

The Government of Canada's offtake deal with Nouveau Monde Graphite functions as a **contract-for-difference** (CfD): Ottawa commits to purchase 15,000 tonnes per year of graphite at a fixed floor price of ~US$1,500/tonne, thereby guaranteeing NMG the revenue certainty needed to unlock project financing. Rather than stockpiling the material itself, the government will work with NMG to market the volume to allied countries and strategic buyers, collecting 50% of any profits above the strike price. This is a significant policy innovation: by using a price guarantee rather than a direct subsidy, Canada has created a demand-side instrument that de-risks private investment in critical minerals without requiring public ownership of the commodity.

The IEA suggests that market concentration and overcapacity make traditional TC/RC benchmarks increasingly obsolete, noting a shift toward customized agreements such as prepayment deals and cost-linked pricing. Our proposal for Canada's TC/RC-linked offtake and/or TC/RC CfD would position Western processing capacity within this emerging contracting reality while explicitly advancing diversification and resilience.

Table 4 *Simplified variables for a Contract for Difference (CfD)*

BASED ON SPECIFIC DATA FROM A MINING PROJECT	
Specific Market: Commodity & Value Chain	
P_{mkt}	Commodity Market Price in USD
V_{annual}	Annual volume (tonne/year)
Variables to Adjust for a CfD	
P_{strike}	Strike Price in USD
T	Contract Length (years)
U_{gov}	Government Upside (%)

$$\text{Government Liability or Revenue} = (P_{strike} - P_{mkt}) \cdot V_{annual} \cdot T \cdot U_{gov}$$

There are tradeoffs in the design of contracts-for-differences that the government should be mindful of. In principle, firms want pure insurance: a high strike price and no revenue sharing above the strike. The government would like to offer a low strike price and capture all the upside. In between are a variety of situations where the tightness of the strike to the five-year average price is traded off against upside. The Nouveau Monde deal strikes a nice balance: a 50/50 split above the strike, and a solid strike price that is tight to the five-year average. This should be what the government aims for, taking into account the proposed economics of the specific project. That is, the government should be willing to offer a high strike in instances where a project needs it in order to be viable, and where the government is confident that the long-term price is likely to rise.

In these instances, a high strike with an even higher government share above the strike would be called for. In copper, for example, a high strike of $13,000 could be justified if the government captured 75% of the upside above the strike. Proposing this also tests the firm's will: if they balk, they are confident the price will rise as well, and a lower strike could be offered instead. This dynamic in the negotiations will be central.

Contracts are best bundled together in a hedged portfolio. A hedged portfolio is less risky than a single contract since, all else equal, volatility in one metal is greater than that in two or more. The more contracts, the lower the overall risk in the portfolio.

Much hinges on how the government's liability is assessed. If the government must book the full value of the contract (the absolute worst case, where the commodity price goes to zero over the full life), then it will be expensive but still possible to manage a portfolio of price mechanisms. If the government needs only book the fair market value of the contract, then the liability will simply be the current gap between the strike price and the market price. Even with a 20% uncertainty band, this would cap the cost of a large copper contract at $1-2 billion.

Specifically for copper smelting, the proposed instrument is simple: a Nouveau Monde-like offtake for a mine that specifies, in advance, the treatment and processing charges linked to the Western smelter.

The offtake agreement could also define treatment charges and pricing mechanisms for secondary metals that may not be economically viable on their own, thereby enabling Canada to strengthen domestic processing of defence-critical metals recovered through copper smelting and refining. This could be achieved by formally integrating the new smelter into multiple mining offtake agreements.

Another option would be to establish a Contract for Difference that applies specifically to treatment and refining charges and is limited to minerals extracted from Canadian mines. Such a mechanism would bridge the gap between economically viable domestic charges and the lower global fee environment driven by Chinese overcapacity, where spot TC/RC have been negative since 2024, and the 2026 annual benchmark settled at USD $0/t.

Table 5 *Policy tools that could be used to support a new domestic copper smelter*

POLICY TOOLBOX FOR A WESTERN COPPER SMELTER	
Tool	**Effect**
Offtake Agreement	Provides long-term revenue certainty for both the mine and the smelter, supporting investment decisions.
Copper CfD	Stabilizes copper price exposure, improving project bankability and economic viability.
Portfolio of CfDs	Diversifies and manages fiscal risk exposure for the government across multiple projects or commodities.
Marketing Options	Allows private-sector buyers or strategic off-takers to purchase refined copper at prices above a predefined price threshold.
Specify TC/RC and Link Mine to New Smelter in Agreement	Aligns domestic mine production with the new smelter's capacity and feedstock requirements, strengthening local value-added processing.
Specify TC/RC for Metal Byproducts	Incentivizes domestic recovery and refining of strategic secondary metals from copper smelting and electrorefining.
CfD on TC/RC	Applies to treatment and refining charges for minerals extracted from Canadian mines, covering the gap between economically viable domestic charges and lower benchmark charges offered in China.

6. CONCLUSION

Provided that a robust market assessment, permitting, Indigenous support, a concentrate availability study, and a good understanding of the competing forces are completed and confirm this need, along with Government support and intervention, we recommend that a new copper smelter in Western Canada should:

- Be ideally located on the B.C. coast, as a tidewater port offers easy access to copper mine projects in B.C. and the Yukon, as well as to international markets. B.C.'s grid relies mainly on hydroelectricity, and the potential for geothermal energy further strengthens this option.
- Leverage this location to attract feedstock from Peru and Chile, in addition to local copper feed.
- The Edmonton region should be considered as an alternative location. The Heartland's challenging issues remain the cost of transporting concentrate feed and copper products, as well as the carbon-intensive nature of the electricity grid. However, the region benefits from a good social licence, an infrastructure ready for heavy industry development, and locally produced oxygen systems necessary for a smelter.
- Accommodate scrap as a secondary feedstock, thus guiding the choice of smelting technology. However, the new smelter should focus on smelting concentrates in its early years of operation.
- Meet strict environmental regulations. A newly constructed modern copper smelter will meet strict targets, as do modernized smelters in Germany, Scandinavia and Spain. Sulphur dioxide gas is treated to produce sulphuric acid, a valuable by-product. Arsenic is immobilized in solid slag form, and smelter slag can be treated to produce a useful inert material.

- Take advantage of the sulphuric acid byproduct to support certain markets. It should also provide an opportunity to co-locate other critical mineral processing plants, such as nickel leaching, rare-earth separation, or phosphoric acid production. Battery recycling could also be supported.
- Use a carefully crafted mix of a portfolio of contract-for-difference and off-take agreements for copper and byproducts, marketing agreements, and specified treatment and refining charges to link mines to the new domestic smelter and support its operations.

REFERENCES

Allan, B. Catalyzing Demand: Critical Minerals and Canada's G7 Leadership. The Transition Accelerator, 2025. https://transitionaccelerator.ca/news-and-insights/catalyzing-demand-critical-minerals-and-canadas-g7-leadership/.

Allan, B.; Eaton, D. Getting Prices Right: Securing Critical Minerals Demand to Catalyze Mine Development. The Transition Accelerator, 2024. https://transitionaccelerator.ca/reports/getting-prices-right/.

Coursol, P.; Mackey, P. J.; Diaz, C. M. Energy Consumption in Copper Sulphide Smelting. Proceedings of Copper, 2010. https://pyrometallurgy.co.za/pjmackey/Files/2010-Coursol.pdf

Dhir, S.; Nishiumi, M.; Kim, T.-Y. Copper prices have hit record highs, but smelters face mounting strategic pressures – Analysis. IEA. https://www.iea.org/commentaries/copper-prices-have-hit-record-highs-but-smelters-face-mounting-strategic-pressures.

Global Critical Minerals Outlook 2025. IEA, 2025. https://www.iea.org/reports/global-critical-minerals-outlook-2025.

Kellogg, H. H.; Henderson, J. M. *Energy Use in Sulfide Smelting of Copper*. In Extractive Metallurgy of Copper; The Minerals, Metals and Materials Society: New York, 1976; Vol. 1, pp 373–415.

Lessard, J.-P.; Brassard, D.-A.; Kerkhoff, A. Étude d'impacts Économiques Du Secteur de La Transformation Du Cuivre Au Québec et de La Fonderie Horne; Glencore, Aviseo Conseil, Fonderie Horne, 2019. https://www.environnement.gouv.qc.ca/ministere/consultation-fonderie-horne/documents/Enjeux%20%C3%A9conomiques/2019-12-06_GFH_Impact_economique_secteur_cuivre.pdf.

Simon, A. C.; Cathles, L. M.; Wood, D.; Bazilian, M. The Widening Gap between Copper Supply and Demand Will Have an Impact on Economic Development and Energy Futures. Energy Research & Social Science 2026, 133, 104581. https://doi.org/10.1016/j.erss.2026.104581.

Söderström, U. Capitals Markets Day; Boliden, 2008. https://investors.boliden.com/sites/boliden-ir/files/files/cmd%20and%20other%20events/2008/13-copper-smelters-revenue-stream-ulf-soderstrom-president-ba-market.pdf.

Teck Modelling Workshop. Teck Resources Limited, 2015. https://www.teck.com/media/Investors-Presentations-Webcasts-20151104-modelling-workshop.pdf.

Ung, S. From Rocks to Power: Strategies to Unlock Canada's Critical Minerals for Global Leadership in Energy Storage, EVs, and Beyond; Battery Metals Association of Canada, The Transition Accelerator and Energy Futures Lab, 2025. https://transitionaccelerator.ca/reports/from-rocks-to-power/.

Ung, S. Towards a Western Canadian Battery Value Chain; Battery Metals Association of Canada, The Transition Accelerator and Energy Futures Lab, 2025. https://transitionaccelerator.ca/reports/towards-a-western-canadian-battery-value-chain/


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