



MASSIFCAPITAL

February 21, 2024

Dear Investors,

2023 was a challenging year; as one can see in the table below, there was a lot of volatility in both long and short books. In the end, we finished the year up in the long book (gross of fees) but not by a meaningful amount, and down in the short book. We have written about short book challenges extensively in the past twelve months, and despite the short book being down in the 4th quarter, we believe we have made significant progress in improving our process and the quality of the short book's investments. As we start 2024, it seems prudent to remind investors of the changes we made so that 2024 short returns can be appropriately evaluated going forward.

Portfolio Contribution (Gross of Fees)	1st Qtr	2nd Qtr	3rd Qtr	4th Qtr	YTD
Long	3.58%	(1.16%)	(6.92%)	5.69%	1.03%
Short	(5.66%)	(0.35%)	2.70%	(2.23%)	(5.46%)
Total Return	(2.08%)	(1.51%)	(4.22%)	3.46%	(4.43%)
<i>Total Return (Net of Fees)</i>	(2.69%)	(1.68%)	(4.59%)	3.20%	(5.79%)
Gross Exposure	103.01%	116.27%	116.20%	116.40%	109.28%
Net Exposure	47.59%	61.97%	66.96%	52.50%	103.83%
Equity and Options Book (Gross of Fees)*					
Energy	(0.58%)	0.39%	1.40%	1.44%	2.48%
Industrials	0.76%	1.11%	(1.77%)	(2.66%)	(2.32%)
Materials	(0.45%)	(3.06%)	(2.16%)	(3.05%)	(8.34%)
Utilities	(0.88%)	(0.40%)	(2.07%)	(1.01%)	(4.57%)
Other	(0.56%)	0.45%	0.38%	0.42%	0.63%
Additional Return Data (Gross of Fees)^					
Tail Risk Hedge (Only Calculated on a YTD Basis)					(1.13%)
Options Trading Return	0.00%	0.23%	1.00%	(0.03%)	1.20%
Isolated Return on Dividends Paid	0.48%	0.52%	2.20%	0.31%	3.27%
T-Bill	0.68%	0.31%	0.31%	0.07%	1.28%

*Data: NAV, Inclusive of Dividends Paid

^Data: Rolling Estimate based on Massif Calculations

The 2023 year for the short book started in the 4th quarter of 2022 when we added several ill-timed shorts. At that time, we had maintained a roughly 1% per annum gain from the short book, which is not particularly impressive but was consistent and helped smooth the return stream. The growth in the short book in the 4th quarter of

2022 was driven by additions of shorts to reduce our net exposure at a time when we thought it would be prudent to do so. Unfortunately, we were out of step with the market when we added the shorts to the book.

Short positions, unlike long, are rarely positions that benefit from time. Going long always has a significant time arbitrage element; the short-term price movement creates an opportunity even if one suffers from short-term volatility. Due to the nature of shorting and the tendency of markets to rise over time, time is not on your side (typically) when it comes to shorting. Last year's 3rd quarter short book demonstrates this well; most of the returns were generated from positions entered in the 2nd/3rd quarter and exited in the 3rd quarter. We shorted with the wind at our backs and got out.

Losses in the 4th quarter 2023 short book were primarily from short positions entered into in the 2nd and 3rd quarters but not exited soon enough. In essence, trend and momentum are essential in shorting stocks, at least regarding the Massif Capital approach. The failure to exit soon enough prompted us to make an additional change to our shorting process. This change involved a closer analytical focus on market internals¹, sectoral trends, and momentum. This year, we will carefully add shorts to the book when market internals, sectoral trends, and momentum factors suggest our timing is correct.

The indicators we are looking at today would have guided us not to add shorts in the 3rd/4th quarter of 2022, most of which did not work out in 2023. They also would have had us close out shorts earlier in the 3rd quarter of 2023 and finally have indicated that we should start adding short exposure to the book in the last few days of 2023. To date, those signals have proven promising, resulting in us adding a mix of sectoral hedges (Sector ETF Shorts) and alpha generating single name shorts that have delivered a 1.5% return for the portfolio in the first month of the year.

We recognize that our ongoing discussion of changes, adjustments, and lessons learned may unsettle some investors who perhaps thought they were investing with a firm and in a portfolio supported by a portfolio manager with unwavering commitment in his proven process. Although we sympathize with this position, after

¹ Market Internals: Market Internals is a term/concept borrowed from John Hussman of Hussman Funds and is our catch-all term for measures of trend uniformity across segments of market activity at the company, industry, and asset class level. The utility of market internals is rooted in two assumptions:

- 1) When investors are inclined to speculate, they tend to be indiscriminate about it, meaning everything gets bought or everything gets sold, and
- 2) When two securities diverge, the dispersion provides information about variables they do not share.

This interpretation fits neatly with the idea that business fundamentals and valuation drive long-term investment outcomes. In contrast, returns over shorter segments of the market cycle are primarily driven by investor psychology – specifically, whether investors are inclined toward speculation or risk aversion. The key variables to track in assessing trend uniformity/speculative mood are observable price action, trading volume, consistency of price action across investable assets at different levels, and other statistical and mathematical constructs that may be considered expressions of investor psychology.

all, Wall Street Hedge Fund managers are usually depicted as masters of the universe, but we would suggest that image is fiction. Our philosophy is fixed; we aim to buy a dollar for fifty cents, and we focus on investing with management teams who are good capital allocators and who are of high character, etc. The philosophy does not change, but how that philosophy gets executed in the market evolves and changes with the market context.

Many of you have invested with other funds, and we believe/hope that when you read our letters, you are surprised by what you read because it is not what you find other managers saying. We think this is unfortunate, as the discussion presented to you in our letters is the discussions we have with other managers, as we knock heads on how to improve and evolve our processes as the operating environment changes and we recognize our behavioral shortcomings and strengths.

Investing is an art; it is not a science. If a portfolio manager is not continuously evolving and improving their processes with lessons learned, they will not be long for this business. We would also add that execution of ideas, and portfolio construction are two areas of an investment practice that are more open to continuous improvement than actual idea selection as they are not only (in our opinion) more subject to market context issues but also not areas that traditional stock pickers are as focused on.

Our idea selection remains in the top quartile of the industry, in our estimation, based on our since-inception batting average of 57% vs. the batting average of a proprietary database of 65,000 equity investments across 195 professionally managed hedge fund and mutual fund portfolios and maintained by Essentia Analytics, in which only 23% of managers had a hit rate on investment selection of greater than 50%. Our challenges with short positions in 2023 are a prime example of how asset selection remains a secondary problem for us relative to other timing and portfolio construction issues.

Our company-level analysis of what would happen to, for example, earnings (as in the case of our Steel Shorts) or the struggles firms would have with permitting projects (as in the case of some materials shorts) turned out to be correct. Still, the context in which we entered those shorts resulted in those issues not moving the stocks. The company read was accurate, but our read on the market concern or lack thereof for fundamentals in the short to medium term was wrong.

Our timing and read on the market environment and what might move stocks was wrong. The issue was compounded by our sizing within the portfolio of the short book overall and the individual positions. As the environment changes, we must evolve and improve how we execute the ideas we select based on our fundamentals-driven philosophy. We have had a somewhat relentless focus in the last year on these issues, especially in the short book, where, because of structural problems with shorts, these issues play an outsized role in performance.

Geopolitical Investing Context

With roughly 40% of the world's population expected to cast votes for political leadership in 50 national contests and numerous conflicts globally, 2024 could be one of the more eventful years for geopolitical events impacting investors. There are inevitably several events that could affect our portfolio; luckily (in a somewhat cynical way), the areas of our portfolio most at risk due to geopolitical events are areas of the world that are already the worst hit by violence and the on-ground activity is not expected to change in 2024.

According to ACLED (The Armed Conflict Location and Event Data Project), in 2023, 97% of all political violence occurred in 50 countries. In 2024, the most likely conflicts appear to be in the same places they were last year, suggesting our primary concern should be the rate of change in the severity of existing conflicts. While this is somewhat reassuring, the widespread proliferation of geopolitical strife and the ripe environment for upheaval raises the prospect of increased ripple effects.

Foreseeing the evolution of conflict and violence is challenging enough. While we tend to think our geopolitical risk assessment skills are better than most, we can still be wrong-footed, especially regarding the knock-on effects of events. Some knock-on effects are apparent; take, for example, the US election, the election with the most severe potential knock-on effects potentially exacerbating or calming violence in Mexico, Ukraine, Israel/Palestine, Yemen, and around Taiwan.

The impact of events in the Middle East, where we have limited direct exposure, is more difficult to foresee and can have far-reaching effects well beyond the immediate borders of the conflict zone. Although for many, this may seem a silly commentary, as a conflict in the Middle East is assumed to mean oil prices move up, the story is far more complex. Taking advantage of the situation requires a more nuanced approach; the naive ownership of oil in hopes of further conflict is neither a great speculation nor an intelligent investment.

Instead of the simplistic buy oil read, investors need to dig deeper and look for dislocations that unfold over time and out of sight of the headlines. For example, the Marlin Luanda, a tanker operated by Trafigura carrying Russian Naphtha (a product used to make gasoline & plastics), was struck by a missile in the Red Sea launched by Yemen's Houthi rebels on Saturday, January 27. The Marlin Luanda was carrying 780kb of Naphtha for delivery to Malaysia. Asia imports 400kb/d of Russian and European Naphtha to meet various petrochemical feed requirements. In recent weeks, longer voyages around the Cape of Good Hope have delayed February Naphtha deliveries. This strike exacerbates the shortage.

Events have substantially tightened the Asian Naphtha balance and are raising spot prices. Some Asian cracker operators have been forced to trim naphtha-fed steam cracker runs. This will have knock-on effects downstream of petrochemical processing. Meanwhile, naphtha price weakness in Northwest Europe has built as ships lay idle and inventories build. The East/West Naphtha Spread for February 2024, measuring the difference between Naphtha cargoes into Japan and Northwest Europe, is up 300% since the start of the Red Sea crisis in October last year. This would have been a thoughtful speculation.

A speculator would have to be nimble though. Complicating the situation described above are efforts by the Ukrainians to strike back at Russia, which recently took the form of a drone strike on Russian refining assets (Ust-Luga and Tuapse refinery); these strikes impacted Russian Naphtha production. The Russian barrels have tended to end up in Asia, and we would be surprised if this confluence of events did not tighten the European balance as Asia seeks replacement barrels. Put another way, inventories of European Naphtha are up, as exporting it via the Red Sea to Asia has become problematic; at the same time, events in Russia are increasing Asian demand for that same inventories of European Naphtha. The spread will settle as the market rebalances to the new geographic paradigm, but first, it might overshoot further.

Waves of geopolitical events tighten markets at different times and places, unsettling supply chains stretching across the globe. Within quantum physics, superposition is a concept that occurs when two or more waves combine as they come together at the same place and time. Waves superimpose by adding their disturbances; each disturbance corresponds to a force, and all the forces add. If the disturbances are along the same line, the resulting wave is a simple addition of the disturbances of the individual waves, that is, their amplitudes. The superposition of geopolitical events is what we need to watch out for this year, as events in multiple places across the globe create crosscurrents that may retard or reinforce the currents arising from events elsewhere.

Clarifying Comments on Climate Change and Reworking our Energy System

Massif Capital has always been focused on liquid real assets. As a result, for most of the firm's life, roughly a third or so of the portfolio has been focused on businesses and projects related to the transition to a low-carbon economy. These investments range from lithium mining firms to industrial businesses producing equipment that facilitates core industries in the economy.

The common denominator among most of these investments has been a recognition by management teams that good environmental stewardship was a good business practice but not the purpose of the business. There is no money to be made in being a good environmental steward for the sake of the environment; there is money to be made in producing goods and services that are in demand and doing so in a way that produces as few negative externalities as possible. Inevitably, negative externalities cost businesses money; they might not cost firms when those externalities initially occur but will eventually cost businesses and shareholders money.

In this way, Massif Capital could be said to be focused on investing in polluting industries necessary for modern life in as thoughtful a way as possible. Reducing pollution makes good sense, but that must be balanced by human needs and economic sustainability. We need energy, chemicals, and transportation, and until someone invents a perpetual motion machine, these needs cannot be addressed without creating negative externalities. There is no free lunch.

Because there is no free lunch, we have long been skeptical of the transition narrative. We are confident in the claims that carbon emissions and our economy, in general, are hurting the environment. Still, that observation alone does not tell us what we should do about this reality. Not only does the focus on carbon, to the near exclusion of all other negative environmental externalities, seem short-sighted at a minimum, but the proposed solution set seems half-baked from an engineering perspective. The near-religious adherence of many to the renewables/batteries/EV narrative only worsens it.

The lack of introspection, in our opinion, by the renewable and EV boosters has always been confusing. The conviction with which many have argued for forcing renewables and EVs on society seemed misplaced. What a difference a few years and an energy crisis in Europe can make to a narrative. Renewables and EVs are now beaten down and out of favor. Many long-time detractors are now taking unwarranted victory laps as if a change in the narrative is some kind of triumph worth celebrating.

The detractors are missing that the problem with the renewables/EV decarbonization solution set was never renewables and EVs but rather the political claim of their universality. We never tire, it seems, of saying this, but just like any other extractive industry, solar and wind can be great businesses; as long as you are extracting those resources where the "grade is high," EVs are the perfect vehicle for those of us that live in the suburbs and drive short distances from our homes to work, kids soccer games and out to dinner, less so for the farmer that lives in the rural Midwest. Boosters confused an ancillary benefit (decarbonization) of the product with the purpose of the product, and detractors confused the policy prescriptions with the business case.

The purpose of wind turbines and solar panels is not decarbonization but the production and delivery of electricity. Wind turbines and solar panels must deliver their energy service better than other energy services to make sense; they cannot do this everywhere, only in certain places. The purpose of an EV is not decarbonization; it is to get a person efficiently, comfortably, and safely from point A to point B; if the EV cannot do that, the ancillary benefit of decarbonization has no purpose or value.

Understanding the use case of a product is critical to business and investment success. The negative shift in narrative over the last twelve to twenty-four months regarding wind, solar, and EVs is repeating the mistakes of the boosters. EVs are superior to ICE vehicles for specific use cases, and wind and solar are superior to natural gas and coal in certain specific use cases. The market and market participants have often tossed the baby out with bathwater, failing to recognize this reality.

The world is a complex place made more challenging by both the scale of human needs and the diversity of context in which those needs must be addressed. While there is no such thing as a free lunch, having a diversity of tools to address those needs such that the requirements of a situation can get a tailored solution is as close as we are going to come in the real world.

We would also like to note that when it comes to our investments in businesses like renewables and EVs, the economics of many of the projects we are invested in justify their existence, irrespective of their role in a broader transition. Perhaps more importantly, the economics relative to our purchase price justify the investments on our part. Whether you think EVs and renewables are the solution to climate change or a mirage is beside the point. The money is made by buying and selling well, not necessarily in being right or wrong about the utility of the product, project, or business within a global effort to decarbonize.

Lithium Overview and Position Update

Investing in the Lithium mining and processing industry has gotten very tricky; this is perhaps no surprise; after all, the sector was nascent just a few years ago and is now taking center stage in a global transportation transition. Furthermore, for those who do not follow these things as closely as we do, the spot price sold off roughly 75%-80% in 2023, depending on what price index you are looking at, having risen close to 800% from the 2021 low to the 2023 peak. At the same time, the contracted prices that key producers received in 2023 were higher than those received in 2022. A significant divergence has emerged between the transparent but little-used spot price and the opaque but industry-standard contracted prices.

As an industry still in its early stages of evolution, there are few management teams worth investing in, geopolitical risk, and significant medium to long-term potential. The cost of entry for such opportunities is considerable volatility. As usual, we are unsure where the market is going in the short term, but we have a sense of the general direction in the medium to long term and are investing on that basis. What follows is a wide-ranging discussion of the commodity, the supply and demand situation, our current investments and positioning, and our thoughts for the year ahead.

What We Own and What We Are Short

Currently, we remain, at a small size, invested in two lithium mining firms, Lithium Argentina and Lithium America. Both companies were part of a single entity (Lithium America Original) as recently as October. That entity was a long-time Massif Capital Investment initiated in March 2020 at roughly \$2.5 per share. At the time, the firm was in pre-production at two assets, an Argentina-based lithium brine deposit and a US-based clay deposit, to which we attributed little value because of the state of processing technology.

We used the stock's volatility to great advantage throughout 2020, 2021, and 2022 as we repeatedly sold both puts and calls on the company, reducing our entry cost below zero via premium earned on those options trading activities. In 2021, the stock peaked at roughly \$39 a share, a roughly 1,460% gain on our purchase price. Given the state of the firm's assets, we should have cut the entire position instead of just trimming. We had confidence in the management team, and momentum and enthusiasm for all things EV and battery were strong, offering the potential for the market to run the price well past any reasonable value. Furthermore, at the time, the lithium prices we were seeing implied a fair value of the two development assets

well north of \$40 a share, and we were having trouble understanding how long the trend of sky-high prices would last.

We have written about our misstep in not selling the whole position in the past, so we will not belabor the point. The stock traded down after that initial peak, regaining its highs again in 2022 before selling off, bouncing to more than \$30 a share, and then falling precipitously to the current combined share price of both companies of roughly \$6 to \$8 a share, still a 150% gain from our initial share price but also a fall of 69% from the first time we trimmed the position.

In October of 2023, the company split in two, creating a standalone entity focused on operations in Argentina (Lithium Argentina or LAAC) and a standalone entity focused on operations in North America (Lithium America or LAC). We currently have small positions in both, totaling 6% of the portfolio in total. We are taking advantage of the latest LAAC self-off to add to our position and are in the due diligence stage on a third potential lithium investment at a similar development stage as LAC, hence a decision not to add to the position currently.

On the short side of the book, we engaged in two types of Lithium shorts throughout 2023. The first is a traditional alpha-focused company short. Specifically, we assessed Piedmont Lithium, a junior developer with exposure to assets from Canada to Ghana, which is helmed by a management team that, while capable of selling a story, cannot achieve its lofty goals in the real world.

Piedmont is a classic mining stock promotion with little chance of becoming anything substantive. During 2023, we generated a 23% return on the short before exiting it during the 4th quarter. We re-entered the short recently and are currently up a further 50%. We have also partially hedged out long positions in LAC and LAAC via a short in LIT, the Global Lithium X ETF. The hedging position, which we also exited in the 4th quarter, generated a 12.2% return during 2023, and we have re-entered this position based on a combination of weak sectoral internals, continuing negative trend, and momentum throughout the sector and a continued slide in Lithium prices.

The reestablished LIT short position is currently up roughly 17%. In the case of both the alpha-generating company short and the sectoral hedge, timing and holding periods were guided by our evolving execution approach that prioritizes momentum/trend and market internals. Together, our short activities within Lithium were our most successful short activities in an otherwise disappointing year for the short book and represent what we expect to be the case study for how we manage the short book in the future.

Why Do We Still Own LAC and LAAC

In the case of LAAC, we view the business as a compelling value play, with a de-risked producing asset (Cauchari-Olaroz) and the potential to reinvest capital at high rates of return via the development of its Pastos Grandes assets. The company trades at a discount to its fundamental value, a gap that could close in the near term as the company continues to ramp up production. With 40 ktpa in Lithium

Carbonate Equivalent (LCE) production that is 90% contracted under a market price offtake agreement, the firm appears well-positioned to have a successful 2024.

Our fundamental value is based on a net present value of the Cauchari asset, with no upside associated with the potential development of Pastos Grandes. We have slightly adjusted the 2020 Definitive Feasibility Study (DFS) production levels and significant adjustments to our expected operating costs. Then, we valued the asset at various lithium carbonate price levels.

We run our valuation at lithium carbonate prices of \$15k per ton, \$22.5k, and \$30k vs. the current reported South American Lithium Carbonate FOB Swap price of \$16.0k per ton, which is down 43% or so in the last three months. The primary difference between the DFS asset level operating model and our own is in the operating cost of the asset. The DFS indicates that in 2020, the firm expected an operational cost of roughly \$3,500 per ton of lithium carbonate. Of that, approximately 51% of the cost was for reagents involved in the chemical conversion of lithium brine to battery-grade lithium carbonate.

The reagents used in the production process include chemicals such as soda ash (sodium carbonate), which is up 25% since the DFS publication. Labor and power account for a further 13.4% of projected CapEx; based on conversations with industry participants, both costs have increased. We assess that the projected cost of production is thus unlikely to be achieved. Based on a review of industry data, we believe that the operating cost of brine assets is closer to \$5,500 a ton. As such, we ran our valuation at that level.

We expect the gap between the current market price and our fundamental value to close soon as the firm ramps up production this year. Total production capacity is anticipated to be achieved by mid-2024, as is a battery-grade lithium carbonate product. During last year's initial ramp-up and in this year's first half, the lithium sold is technical quality lithium, which falls short of battery quality. In addition to reaching the asset's commercial run rate in 2024, management is focused on stage 2 of the assets, which is expected to add 20ktpa of capacity to Cauchari.

At the current time, the firm looks expensive in comparison to peers, but that changes rapidly as the firm ramps up production in the coming years:

Ticker	Current EV	EV/Target Production Capacity (\$/t LCE)			
		2023E	2024E	2025E	2026E
ALB US Equity	\$17,191	\$106,411	\$93,835	\$77,901	\$68,131
AKE AU Equity	\$5,128	\$105,491	\$48,312	\$30,195	\$25,564
LAAC US Equity	\$935	\$230,345	\$32,906	\$28,793	\$23,034
LTR AU Equity	\$3,017	N/A	\$132,895	\$66,447	\$66,447
LTHM US Equity	\$2,743	\$73,496	\$48,806	\$40,046	\$40,046
MIN AU Equity	\$13,755	\$131,088	\$131,088	\$131,088	\$131,088
PLS AU Equity	\$7,907	\$106,934	\$99,137	\$99,137	\$67,498
SGML US Equity	\$3,171	\$120,437	\$46,907	\$42,848	\$42,848
SQM US Equity	\$15,498	\$77,364	\$67,693	\$55,073	\$53,796

Source: Company Reports, Bloomberg, TD Cowen & Massif Capital Estimates

At the current spot price for South American Carbonate, we believe LAAC will produce an attributable average annual EBITDA of roughly \$350 million per year for the first ten years of the firm's operations. The peer group above has a mean EV/EBITDA of 6.1x, implying an EV of \$2.1 billion, suggesting a Market Capitalization of \$2.0 billion, a per-share value of roughly \$13 a share. The relative valuation is a little punchier than our NAV-based valuation but is in the same ballpark.

This analysis does not consider any potential upside from the firm's Pastos Grandes project either. It is still early for this project, so we do not need to include it in our valuation until we have further information, but it is highly prospective. It is unclear how long it will take to accumulate sufficient information to start thoughtfully including the project in our valuation. Still, we are optimistic that it will occur over the next 12 to 18 months. Currently, we find the project more useful or helpful in evaluating the management team's capital allocation skills.

As some detractors have pointed out, the management team that made Pastos Grandes acquisition differs from the team currently running the business. Key players decamped to the new Lithium Americas, but we would respond by noting that the team that ran South American operations during the acquisition is the same team currently running LAAC and, thus, is likely to have had significant input into capital allocation decisions. This is encouraging as the firm's acquisition of Millennial Lithium, which is how the business acquired the Pastos Grandes project, was highly economic.

Based on our analysis of a handful of recent lithium acquisitions, we believe the LAC/LAAC team paid 75% less per ton of resource basis than peer transactions.

Announced	Acquirer	Acquired	Deal Value (\$MM)	Resource (Mt LCE)	Deal Value/Resource (\$/t LCE)
Oct-21	Zijin Mining Group Co Ltd	Neo Lithium Corp	\$737	7.63	\$97
Nov-21	Lithium Americas Corp	Millennial Lithium Corp	\$390	5.3	\$74
Dec-21	Rio Tinto PLC	Rincon Mining	\$825	11.8	\$70
May-22	Zijin Mining Group Co Ltd	DunAn Holding Group	\$1,125	2.14	\$526
Jul-22	Ganfeng Lithium	Lithea Inc	\$962	3.6	\$267
Dec-22	Lithium Americas Corp	Arena Minerals Inc	\$227	0.6	\$378
Sep-23	Albemarle Corp	Liontown Resources Ltd	\$4,359	5.4	\$807
Average					\$317

Source: Company Reports, Bloomberg, TD Cowen & Massif Capital Estimates

Time will tell if the current team allocates capital as well as the prior team, but given the instrumental role they must have played in Pasto's Grande's acquisition, we are comfortable betting that they will. Currently, we have a 5% position in the company and are adding when it trades down. While unsure of our final target allocation weight, we are theoretically comfortable allocating as much as 7% of the portfolio to LAAC.

Unlike LAAC, which is ramping production and selling lithium, even if it is still just technical grade, LAC is developing an asset that the management team hopes to turn on towards the end of 2026, with initial construction starting last year. Although we are confident that management will be successful in the fullness of time, a sentiment shared by management at GM, who is footing the bill for a big chunk of the construction cost and has 100% of the offtake from the mine for the first ten years, we favor allocating additional available capital to other opportunities.²

If we don't intend to add to the position in the short term and believe there are better opportunities, why continue holding? At 1%, our de minimis position is a toehold that has to be added to in the future but need not be added to in a rush. On the surface, LAC has many strengths: strong management, strong backing, a first-of-a-kind flow sheet that appears likely to deliver a cash cost per ton of LCE at roughly \$7,000 vs. current US spot prices of \$17,000, and an opportunity to be the largest producing lithium mine in North America. These are all critical variables, but the assets' real strength lies below ground in the deposit's geology.

Although, in geological analysis terms, we are still in the early days of understanding the nature of claystone lithium deposits, a recent journal article published in Science Advances by a trio of volcanologists suggests that the McDermitt Caldera, which houses the Thacker Pass deposit, could be among the largest lithium deposits in the world.³ Only time will tell if the geological model the team (which included a LAC geologist) can be used to explain other examples of hydrothermally enriched lithium

² Based on material intensity estimates from BNEF and Benchmark Materials, Thacker Pass phase 1 should produce enough LCE for roughly 800,000 EVs annually. Illustrative 60 kWh batteries use between 45 kg and 50 kg of Lithium Carbonate per battery depending on chemistry (LFP vs. NMC). GM sells roughly 2.2 million cars a year in the US.

³ Hydrothermal Enrichment of Lithium in Intracaldera il-lite-bearing claystones, 30 Aug 2023, Science Advances

deposits and thus justify the claim that the deposit is one of the world's largest, but it is promising.

One of the challenges with mining firms, especially when discussing tier 1 assets like Thacker Pass, is that the actual value of the asset cannot be fully captured via an NPV calculation as the future cash flows extend far beyond the point at which discounting them back implies little or no value. At the same time, we know those future cash flows are not worthless but distant. We are sure that some finance professors somewhere will find this line of thought dubious, but we stand by the idea that there is value in assets with lives that can stretch to 50 or more years that cannot be captured via discounting cashflows.

Why is now a good time to remain invested and deploy new capital into Lithium?

Two widespread narratives are wrong-footing the market's outlook for Lithium. The first relates to EV adoption, and the second to the near-term lithium supply growth dependency on robust Chinese and African production.

EV Adoption Narrative

Our outlook for EV adoption has long been at odds with the prevailing narrative. Universal adoption of EVs has always seemed unlikely, nor are we convinced that EVs are necessarily the best solution for the environment.⁴ Nor do we believe that decarbonization is a selling feature of EVs. EVs are cars, so they must compete with ICE vehicles to address the needs of drivers: getting a traveler from point A to point B at an acceptable cost (a driver-specific variable) with a degree of comfort, safety, and efficiency. The low carbon footprint is a positive externality of EVs, not a selling point, except for a self-selecting minority of buyers.

On this basis, EVs are fit for purpose for a large segment of the population in the United States and even more people in Europe and China (although for different reasons), the three most significant markets. If we focus on the United States, there

⁴ As with everything "green" and "renewable," numerous environmental tradeoffs occur. Usually, they trade carbon emissions for some other negative environmental externality. In the case of Thacker Pass, for example, the mine is located in an area of Nevada that is a significant Sage Grouse breeding ground. In the case of Ioneer's Rhyolite Ridge project, another Nevada Lithium Clay deposit, botanists have found a wildflower called Tiehm Buckwheat, which, as far as anyone knows, only grows in the lithium-rich soil of the proposed mine's specific corner of Nevada. The buckwheat is a prolific seed-bearing plant and, as such, is considered an important part of the ecosystem, feeding birds, rodents, and insects, who in turn are the food of various larger predators. Regulators and Ioneer are thus faced with a choice that has no definitive right answer: which is more important preserving a unique plant found nowhere else in the world or mining lithium? This type of question is becoming increasingly common for extractive resource projects. Interestingly enough, ~40% of the known Tiehm Buckwheat population was destroyed by burrowing rodents in 2020, trying to get access to the water-heavy roots of the plants during an exception dry year. It turns out we are not the only invasive species that may destroy delicate environments when confronted with a resource access problem.

are 82 million single-family homes, the ideal parking place for an EV. Roughly 175 million Americans live in the suburbs, which are the perfect location for EVs with short travel distances, lots of at-home parking, and few of the drawbacks EVs face for the 46 or so million Americans that live in rural locations or the 100 or so million that live in urban/city cores. The average American drives less than 40 miles a day, well less than the distance of a single EV battery charge. They are as comfortable as any other car and more energy efficient (ICE engines convert only 40% of the power in gasoline into movement; the rest is wasted, primarily as heat).

Many argue that EVs are too expensive. This is a red herring. In 2022, the average price of a new car in the US was \$47,000; in 2023, it was \$49,388. According to Kelly Blue Book, the average luxury car sold for \$62,523 in 2023. The cheapest car sold in America is the Kia Forte at \$20,815. Meanwhile, the average EV cost was \$53,469 in 2023; the most affordable EV was the Chevrolet Bolt at \$26,500. Admittedly, both the average and low end are more expensive than the average ICE and low-cost ICE but not outrageously more expensive, especially given that we are still in the version 1.0 stage of EV development at scale.

The day-to-day operating cost is cheaper, and short to medium-term maintenance tends to be less, hence the pushback against selling EVs from dealerships that make most of their profit on maintenance. However, it is still early days to say they are cheaper to maintain. The battery will need to be replaced at some point, which won't be cheap; we acknowledge that and believe that given what we have termed the V 1.0 stage for EVs, it is still unclear what the actual ownership cost of an EV throughout a 10 to 15-year ownership cycle might be (this cycle is based on the average age of a US car which is currently 12.2 years).

Many readers will be familiar with the writing of Doomberg, the well-known and anonymous substack author who recently noted in a post that things that were "expensive or impossible a few years ago routinely become commonplace over time." Given the strengths and weaknesses of EVs as vehicles, we would say that version 1.0 seems to be in an excellent position to become commonplace for specific use cases. Given the weakness of batteries in certain types of environments and energy density issues, barring significant technological breakthroughs, they may never be fit for purpose for all use cases, but they also don't need to be for lithium demand to grow significantly.

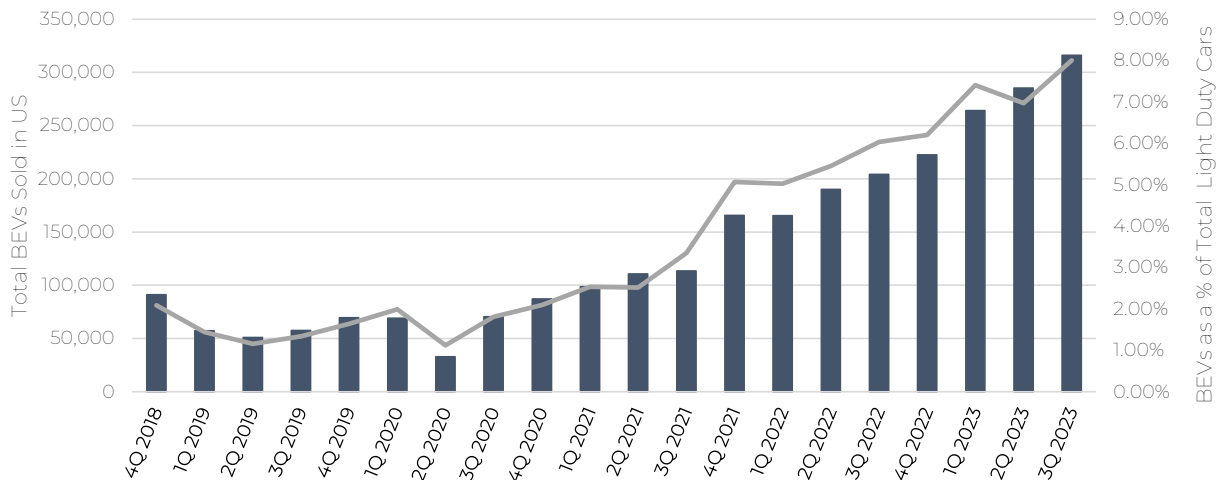
So, it would seem that for a specific demographic, those that live in the suburbs, for example, the EV can compete with ICE cars in terms of the variables we believe cars are assessed on; if so, why are EV sales flagging? Why are these the headlines one sees about EVs:



Your guess is as good as ours, as these headlines don't sync with the data. If we start in the United States, the picture is quite different than the headlines imply. In the third quarter of 2023, roughly 8% of total cars sold in the US were Battery Electric Vehicles (pure EVs, excluding plug-in hybrids). YoY at the end of 3Q2023, total sales of EVs in the US were up 54%. Admittedly, that is slower than the growth of 3Q2022 vs. 3Q2021 when EV sales were up 79%, but in the first three quarters of 2023, 10% more EVs had been sold in the US than in all of 2022. We are seeing a slowing in the growth of EV sales, not a slowdown in the absolute number of EVs sold.

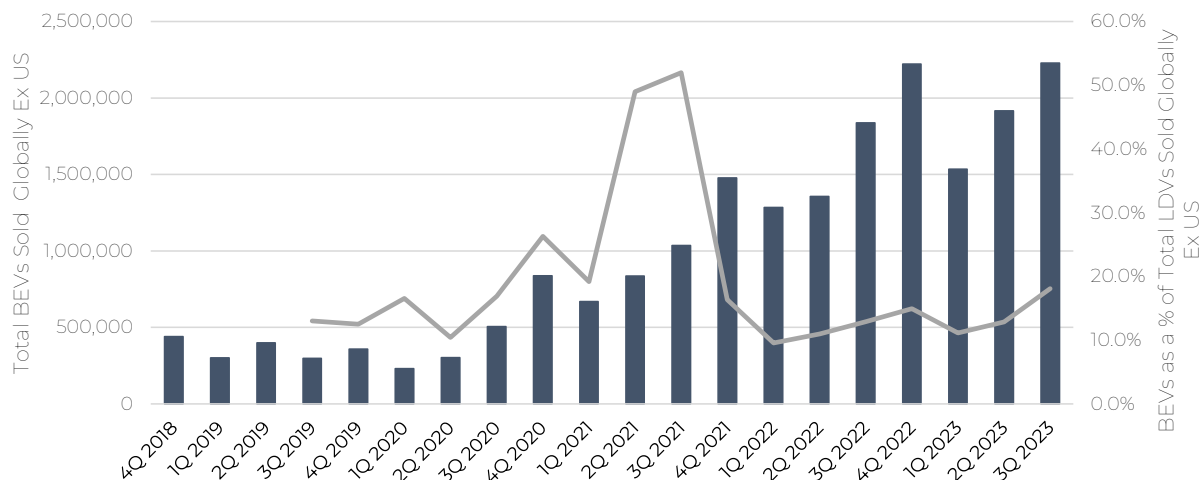
Perhaps more interesting, the headlines and articles fail to convey the actual EV story, which has little to do with the United States, a secondary market for EVs, in our opinion, where only the suburban demographic is the right target audience.

BEV Sales in United States



Globally, in the 3rd quarter of 2023, 12.3 million passenger cars and light trucks were sold, 18% of which were EVs, up from an average of 12.9% during the previous four quarters. Far from slowing, it does appear that sales are accelerating globally, with the US the laggard. The graph below shows that the world suffered a post-pandemic overhang and now looks to be inflecting up.

BEV Sales Globally ex. US



The result of 2023 global EV demand growth is an EV lithium demand of ~550,000 metric tons of lithium carbonate equivalent (LCE) with an additional ~425,00 metric tons of LCE demand from all other sources (E-Bus, Two and Three Wheelers, Consumer Electronics, Energy Storage, Commercial EVs, and other), bringing our estimate of 2023 total demand to roughly 975,000 metric tons of LCE. This estimate aligns with demand estimates from Goldman Sachs, which estimates 2023 demand at 971,000 metric tons of LCE and several other sell-side shops.

The supply-demand balance suggested by 2023 numbers implies that if 2024 global EV demand growth matches 2023 demand growth, the world needs another 110,000 metric tons of LCE or ~3 mines the size and quality of Lithium Argentina's Cauchari to turn on, and no growth in any other lithium demand source but EVs. Put another way, the rate of EV growth is slowing, but it is not slowing sufficiently that we don't need to add multiple tier 1 lithium deposits every year to meet that demand.

The Lithium Supply Narrative

We estimate that in 2024, the lithium market will be roughly in balance; in the future, we believe that, at worst, supply and demand will remain in balance for some time. We characterize the worst-case scenario as balance because it depends on some critical assumptions, specifically the Goldman Sachs production estimates of production out of China and Africa.

Neither forecast seems sensible to us; hence, we believe that a S/D balance is the worst outcome and a deficit the most likely. Goldman's forward-looking estimates of Chinese production are particularly suspect and suggest a dramatic boost to global supply starting this year. If we have correctly questioned both supply outlooks, the market will be in deficit rather than surplus this year.

Goldman estimates that Chinese production will increase by 55% to 442,000 metric tons of LCE this year. Then, production will ramp up by a further 47% to 654,000 metric tons in 2025, overtaking Australia as the world's largest lithium miner. This production growth will see China accounting for 50% of global supply growth in

2024 and 2025. Achieving it will depend on China mining its Lepidolite hard rock resources, which currently account for a limited percentage of worldwide production and, as assets, are all on the right side of the cost curve.

Chinese Lepidolite deposits are some of the worst lithium deposits globally, with grades that are anywhere from 17% to 25% of the grade of Australian spodumene and an ore-to-chemical ratio of 120:1 to 300:1 vs. Australian Spodumene of 20:1 and 75:1. The result is that Chinese Lepidolite deposits require roughly 50% more energy to process than Australian spodumene.

Goldman estimates the unit mining cost of Chinese Lepidolite is between \$3,800 and \$9,800 per ton of LCE vs. Australian Spodumene at \$1,800 to \$7,400 per ton of LCE. We suspect that Goldman has mispriced not only the unit cost of mining but also the all-in cost of production in China. Rather than costing between \$10,000 and \$12,000 per metric ton of LCE, the energy and material intensity appear to imply it is between \$13,000 and \$15,000 per metric ton or more, and at best, about what Benchmark Minerals estimates Chinese Lithium carbonate currently sells for in the spot market. If that is the case, the only growth out of China will be growth spurred on by government forces underwriting the industry's economics, which is always possible, but we are not convinced.

Yichun is the center of China's lepidolite lithium mining efforts and aims to quadruple its lithium output via Lepidolite by 2025. If they succeed, production will rise to 350,000 metric tons of LCE annually. This growth is in keeping with Goldman's volume outlook. While lithium boosters in Yichun are numerous, the government is cracking down on multiple miners and smelters setting up shop in Yichun due to environmental issues. Lepidolite extraction and smelting produce toxic by-products, like thallium and tantalum, which cause water pollution, which has already been found in the Jin River. The pollution has prompted the government to curtail production at local operations as the pollution was investigated. According to Creamer Media's Mining Weekly reporting, as much as one-third of production was curtailed during 2023 due to pollution concerns.

Pollution is not the only issue, though, as Lepidolite has a poor lithium grade, resulting in significant waste rock that must be disposed of. According to Ma Jun, the director of the Institute of Public & Environmental Affairs, a Beijing nonprofit, to hit the 2025 goal, Yichun's lithium mining industry must find a place to dispose of mine tailings equivalent to nearly ten times the current volume. We understand that permits for tailings are highly limited as regional government authorities give them out, and thus, it is a highly competitive process. Complicating matters further is that often, even after significant processing, the Lithium produced from Lepidolite does not meet the criteria to be considered a battery-grade lithium chemical.

We suspect this final issue is being addressed. Still, we are less convinced by China's ability to process battery-grade Lithium cost-effectively and economically from such a poor-quality precursor. One of the reasons that China has become a hub for the processing of materials is that upgrading materials from low concentrations and purity found in nature to the high-concentration, high-purity form necessary for modern usage is an energy-intensive process. The three laws of thermodynamics

necessitate that the process of high-grading materials be costly; they also mean the poorer the quality and grade of the starting point, the more energy and effort necessary to achieve a highly refined outcome.⁵

Given the energy input requirements, we are not confident that China can cheaply and efficiently produce large volumes of battery-quality Lithium from low-quality Lepidolite. Unless the Chinese government then foots the bill, the lithium output will need to be sold at much higher prices, encouraging other more economic lithium production elsewhere in the world or simply increasing the cost of lithium, which hurts them as much as it does anyone else, as the worlds largest lithium consumer. Admittedly, there is a risk that the Chinese government will try to gain control of the lithium market this way, as they have done before in the case of iron ore.⁶

Chinese efforts to control the iron ore market have not worked to date. Much of the reason efforts to control the iron ore market have not worked are similar to why we do not think it will work in Lithium: the resource quality in China is too low. The advantages of iron ore mining in Australia and Brazil are too high. Geological moats are real, and sometimes, no amount of money can help you span the moat.

The supply/demand balance outside of China that Goldman anticipates also depends on Chinese lithium mining efforts in Africa. In Africa, China has moved much more quickly than the West and has begun the development of at least seven projects that could conceivably produce 305,000 metric tons of LCE by 2027. One of the many challenges with this output is that the Chinese miners expect to ship out low-grade concentrate for smelting and processing in China.

According to Goldman Sachs, this means trucking millions of tons of material, mainly from Zimbabwe to the east coast of Africa or from Mali to the West coast of Africa, with the typical distance from mine to port being roughly 625 miles. Goldman Sachs analysts estimate that the number of trucks per mine needed to accomplish this feat ranges from 739 per day at the Gangengs Mali-based Goulamina project to 88 per day at the Chengixin Sabi Star project. According to Goldman's "satellite checks," the roads generally appear in good shape, but we are less convinced in their ability to assess such things from the comfort of their New York or London offices. A

⁵ The three laws of thermodynamics and the zeroth law (which was not included until the 20th century) summarize the properties of energy and its transformation from one form to another. What is most important to understand for this discussion is that while the universe tends towards increasing entropy, there is no prohibition against decreasing entropy in a specific system, provided that there is a compensating change elsewhere. High-grading material from a low-purity equilibrium state to a high-purity equilibrium state requires the significant application of energy. Thermodynamics is an important tool for interpreting the condition at which natural geomaterial equilibrate and even more important for understanding how to create a new and more useful equilibrium state, albeit one that does not come without an energy tax. [Thermodynamics in Minerals Sciences](#) is an excellent, albeit slightly dry, introduction to the subject.

⁶ [China's Plan to Break Foreign Iron Ore Dependence – Mine More at Home](#)

special report by Bloomberg, published in 2022, about the challenges of exporting Copper from the DRC would seem to support our skepticism that such high-volume material movement won't be as straightforward as Goldman thinks. The conclusion: the roads are a mess, violence is rampant, and delays are frequent.⁷

The point of all this is that we are beginning to reach the point in Lithium demand, even in the presence of slowing EV demand growth (which, as noted above, is quite a marginal issue) that addressing supply sustainably is no longer a function of finding incremental demand at this mine or that mine. It now depends on massive efforts by mining firms, financiers, and governments.

The next two years, which many believe will be years of surplus and may turn out to be so, are a case in point. The forward-looking supply scenarios at most sell-side shops, of which we have chosen to pick on Goldman as the most pie in the sky, depend on hundreds of trucks traversing 100s of miles of African highway every day or significantly ramp production of the lowest grade highest cost lithium mines in the world. We may be early, but we find betting against creating a stable supply that leads to a meaningful surplus arising from such a rickety foundation sensible.

As always, we appreciate the trust and confidence you have shown in Massif Capital by investing with us. We hope that you and your families stay healthy over the coming months. Should you have any questions or concerns, please do not hesitate to reach out.

Best Regards,



William M. Thomson

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⁷ [The Metals for your EV are stuck in a 30 Milite Traffic Jam](#), Bloomberg November 3rd, 2022.