

**WEBINAR WRAP NOTE**
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**PRESENTER SNAPSHOT**

<b>Largo</b>	NASDAQ: LGO
<a href="https://largoinc.com/">https://largoinc.com/</a>	
<b>Presenter</b>	Alberto Arias
<b>Key Material</b>	Vanadium
<b>Positioning</b>	Mining
<b>Geography</b>	Brazil and United States
<b>Los Andes Copper</b>	TSXV: LA
<a href="https://losandescopper.com/">https://losandescopper.com/</a>	
<b>Presenter</b>	Eduardo Covarrubias
<b>Key Material</b>	Copper
<b>Positioning</b>	Mining
<b>Geography</b>	Chile
<b>ION Energy</b>	TSXV: ION
<a href="https://ionenergy.ca/">https://ionenergy.ca/</a>	
<b>Presenter</b>	Ali Haji
<b>Key Material</b>	Lithium Brine
<b>Positioning</b>	Mining
<b>Geography</b>	East Asia/Mongolia
<b>Electra Battery Materials</b>	NASDAQ: ELBA
<a href="https://electrabmc.com/">https://electrabmc.com/</a>	
<b>Presenter</b>	Trent Mell
<b>Key Material</b>	Cobalt Sulfate
<b>Positioning</b>	Refining
<b>Geography</b>	North America
<b>Pivotal Metals</b>	ASX: PVT
<a href="https://pivotalmetals.com/">https://pivotalmetals.com/</a>	
<b>Presenter</b>	Steven Turner
<b>Key Material</b>	Nickel, Copper, Palladium, & Tin
<b>Positioning</b>	Mining
<b>Geography</b>	Canada and Spain
<b>Pensana PLC</b>	LSE: PRE
<a href="https://pensana.co.uk/">https://pensana.co.uk/</a>	
<b>Presenter</b>	Paul Atherly
<b>Key Material</b>	Rare Earths
<b>Positioning</b>	Mining & Supply Chain
<b>Geography</b>	London

**MATERIAL OPPORTUNITIES IN ELECTRIFICATION**

## Overview

On December 14th, 2022, Stonegate Capital Partners held its Material Opportunities in Electrification Webinar. The panelists included Alberto Arias from Largo, Eduardo Covarrubias from Los Andes Copper, Ali Haji from Ion Energy, Trent Mell from Electra Battery Materials, Steven Turner from Pivotal Metals, and Paul Atherly from Pensana PLC. Each of these speakers focused on a key material used in the electrification of vehicles and the grid. The speakers interact with their materials at different points in the supply chain and in a variety of geographic region. It is this cross section of materials, processes, and locations that make each panelist a thought leader in their respective areas.

## Key Takeaways

**Growth in EV sales will drive demand:** The main driver of the demand for these materials is the growing demand for electric vehicles (EVs) and thus the demand for the batteries and motors used in EVs. With sales increases forecasted to be at 30% CAGR over the next four years, it is no surprise that battery demand is expected to increase more than 2,000% by 2040. Considering that EVs use approximately three times as much copper as internal combustion engines, copper is expected to have a 8.5 million ton deficit by 2030 compared to the approximate current copper supply of 25 million tons. This trend of extreme supply shortages is expected to repeat itself across all the metals we discussed on the webinar in varying degrees.

**Current operations will not meet future supply needs:** As discussed above, the supply shortages are forecasted to require more sources for and increased production of these critical materials. For example, the amount of copper mining that is need to meet projected demand is equal to 84 new mines by 2030. The world will need another 74 lithium mines by 2035 in order to meet the lithium shortfall. Some of this will be propelled by regulatory tailwinds as the Inflation Reduction Act in the United States incentivizes companies to decouple reliance on Chinese and Russian supply chains further increasing demand on companies that operate outside of those jurisdictions. It is notable that scrapping and recycling alone will not be enough to overcome the supply shortages.

**Location and quality are key:** Whether it is centrality to a strong labor force and abundant infrastructure for mining or being within accommodative borders for permitting and security of operations, the jurisdiction that these companies have chosen is as important as the materials they are working with. One of the best examples of this are the Vizcachitas mine in Chile being central to infrastructure and located at a lower elevation than many of its competitors in the region. Another notable example is the Electra Battery Materials company that already has permitting secured in their jurisdiction, which gives them a 3-5 year competitive advantage on any other companies that would try to achieve the same. While the location of the lithium brine operation ran by Ion Energy is certainly important, the quality of the mine (above 300ppm) is arguable more important to economic viability when compared to other lithium brine operations.

## Presentation Overview by Company

### Largo (NASDAQ: LGO)

- Largo is the largest primary producer of vanadium in the world. The Company focuses on mining vanadium at their Maracás Menchen Mine in Brazil as well as improving utility scale battery technology. Largo has seen success with their proprietary stack design which uses their Vanadium Redox Flow Battery to deliver increased power density in safe batteries that last 25 years without degradation. These long duration fully recyclable batteries are expected to be used for energy storage on the grid that will contribute to grid stabilization.
- Vanadium has several unique characteristics that make it a key transition metal. It is a metal that makes steel significantly stronger when added to the alloy mix and thus requires less steel per application. It is also fully recyclable in batteries. Currently 91% of the demand for vanadium is driven by its usage in steel, however, overall demand is expected to grow as low carbon transition use cases grow.
- Low Carbon use cases for vanadium are expected to grow demand 173% by 2050. This increase in demand is expected to improve vanadium pricing fundamentals as only 18% of current supply comes from primary producers with the rest coming from secondary producers and recycling efforts. From a geographic lens, over 70% of production comes from China or Russia causing a company like Largo to be strategically positioned to take advantage of shifting supply chains. One innovative way that Largo is making investing in vanadium easier is through the introduction of the Largo Physical Vanadium Corp. which gives investors direct exposure and ownership to Vanadium.

### Los Andes Copper (TSXV: LA)

- Los Andes Copper is the owner of the Vizcachitas project, one of the largest new green field copper projects, located in central Chile. The ownership of this project is without strategic partners or entanglements which is an advantage that is amplified by the location of the mine as well as the experience that is brought by management. Los Andes has recently published their PEA study which shows that they are just scratching the surface of the deposit level.
- As most observers know, Copper is an enabler to the electric transformation. With the average electric vehicle needing approx. 183lbs of copper vs a traditional combustion engine vehicle using approx. 53lbs of copper, per Reuters, it is no surprise that there is an expected copper shortfall on the horizon. This shortfall is forecasted at 8.5Mt by the end of the decade, which is equal to 85 new mines, half of the shortfall coming from increased demand in electric vehicles.
- Scrapping and recycling will not be enough to cover the above forecasted copper shortfall. That is what makes greenfield projects like the Vizcachitas Mine so important, specifically projects sitting on +10bn pounds of copper that would be of interest to a major mining company. When The Company ran their PEA they found that at a copper price per pound of \$3.50 they would achieve an after tax NPV of \$2.7bn, which is very attractive for a project that has \$1.9bn capex. Due to this project being located in Chile, a top 3 mining jurisdiction in the world, and part of a Tier 1 copper belt at a lower elevation than peers, the company plans to eventually bring in strategic partners. It was made clear that Los Andes will not develop this 40+ year life asset by themselves as that would be reckless for a company of their size.

### Ion Energy (TSXV: ION)

- Ion Energy is Mongolia's first lithium brine developer and explorer. They have been in Mongolia for 13 years and have seen the government continue to become more friendly to foreign investors. This was most recently on display when Rio Tinto purchased the Turquoise Hills Resources equity stake in Oyu Tolgoi, Mongolia for \$5bn, sending a signal to other mining majors and helping de-risk the jurisdiction. Currently Ion Energy controls 110 hectares of land, with brine samples showing lithium grades in excess of 300ppm, which is significant when compared to the Silver Peaks Nevada Mine that has 121ppm.
- As with the other commodities described here, there is an expectation that the world will soon see a shortfall in lithium. This shortfall will be compounded by the lack of diversification in mining locations with 90 percent of lithium coming from China, Australia, or Chile. The lithium shortfall is expected to reach 3.322 million tons by 2035, equivalent to 74 new mines. Additionally, Ion Energy extracts lithium from brine which is different and more environmentally friendly process than extracting lithium hard ore. Lithium brine naturally rising to the surface with the brine being replaced after the lithium extraction, a much more gentle process than hard ore mining.
- A large part of Ion Energy's strategic advantage is its location as they are within 20 miles from the China/Mongolia border. This allows for the transportation of the lithium to be significantly cheaper and less carbon intensive than lithium that is shipped from Australia or Chile. Given the above lithium grade that Ion is seeing they are positioned well to take advantage of the increasing demand curve. The current projection for their break-even point is equal to 100ppm, conservatively speaking, which allows for significant ability to take on the uncertainties remaining in their current projects.

### Electra Battery Materials (NASDAQ: ELBM)

- Electra Battery Materials is building North America's first cobalt sulfate refinery that is positioned to take advantage of the onshoring of battery supply chains. They are also involved in cobalt mining in the Idaho Cobalt Belt and black mass recycling, the process of recycling battery materials. Notably, Electra has a three-year strategic supply agreement with LG Energy Solutions equal to 60% of their refinery output over that term.
- As cobalt is one of the most critical inputs in electric vehicles, the increase in EV demand is notable with a 30% CAGR expected over the next four years. This is specifically notable as the United States catches up to the rest of the world with the introduction of vehicle like the electric Ford F150 and Rivian R1T. Additionally, the Inflation Reduction Act is a huge drive for onshoring as companies can only take advantage of the \$7,500 credit as long as they do not source any critical materials from China or Russia. Currently 83% of cobalt refining and 79% of battery cell materials take place in China.
- Electra is well positioned to take advantage of their first mover advantage in providing auto assembly plants with battery grade cobalt and manganese. It was noted on the webinar that for another company to get a refinery to Electra's position it would take 3-5 years to permit and build the infrastructure needed, with the only other notable non-Chinese refinery located in Finland. Electra Battery Materials achieved this position with a very low carbon impact, currently measured at 51% lower than peers, and a easily scalable process.

### Pivotal Metals (ASX: PVT)

- Pivotal Metals (previously Raffaella Resources Ltd.) specializes in mining nickel, copper, and palladium in Canada, as well as tin and tungsten in Spain. The Company most recently completed the acquisition of their Horden Lake development project located in Quebec, Canada. This project will be carbon neutral due to its proximity to hydro power. Being carbon neutral is especially beneficial as part of the project will take place underground where gas fumes could be unsafe.
- Currently battery production accounts for only 7% of nickel supply, however, this is expected to increase to 40% by 2040, doubling the amount of nickel demanded in that timeframe. When it comes to tin, Rio Tinto notes that it is the most impacted metal by the increase in EV demand as tin is used in the soldering applications during EV production. Tungsten on the other hand is the hardest material behind Diamond and has the highest melting point of any metal. There is no tungsten production in North America with most of it coming out of Asian and China. Notably 20% of Europe's tungsten comes from Russia. Tesla has started looking at cobalt free batteries and has experimented with tungsten anodes in the batteries that can charge 10 times faster.
- There are significant Tungsten deposits in Europe with very high grades found in Spain, but the regulatory headwinds make accessing these deposits very challenging. These headwinds make having a mine already open incredibly beneficial. This gives Pivotal a strategic advantage to other junior mining operations that do not have permitted mines in these relatively restrictive environments. While Pivotal is not abandoning their positions in Spain, they are making a deliberate shift to mining in Canada as the regulatory environment is more accommodative. They have been able to secure the Horden Lake position at a discount to their underwriting. This combination of metals and locations makes Pivotal one of the most diversified companies that presented.

### Pensana PLC (LSE: PRE)

- Pensana is a UK based company that focuses on the production of rare earth materials, which are critical to the creation of permanent magnet motors. Where other presenters focused on the materials that go into the battery of EVs, rare earths are focused on the materials that go into the motors of EVs and are a critical part of what can make a Ford F150 Lightning go 0-60 in 4.5 seconds compared to a 2021 v6 3.5L F150 which goes 0-60 in 5.3 seconds.
- 90 percent of rare earths are produced in China, with China spending \$11tn of their own money towards their carbon neutral targets with no obligation to provided the rest of the world with these materials. Much like Electra Battery Materials above, the Inflation Reduction Act is expected to be a significant tailwind for a company like Pensana as the US decouples from Chinese supply chains. Lastly, rare earths also play a significant part in the motors used in offshore wind turbines generating renewable energy. Rare earth demand is expected to grow by 8.3% CAGR until 2035 at which point the supply shortfall with equal approx. 15% of the total demand.
- Pensana is one of 3 companies outside China that is produces rare earth materials, with only Lynas being in production (both Pensana and MP Materials are in development). When compared to Lynas and MP Materials, Pensana is expected to produce 80% and 73% of the rare earths respectively. What is notable is that Pensana is forecasted to do so at 33% and 25% of CapEx. respectively. This competitive advantage is based on Pensana building their own processing facility and tapping into the chemical engineering heritage found in the UK.

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