UPDATE 2

Battery Metals Report 2021

Everything you need to know about the battery metals lithium, nickel, cobalt and copper!

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Preface

Dear Readers,

We hereby present the twelfth edition of our Battery Metal Report.

Our special report series started in autumn 2016 with lithium, as we see this metal, as well as cobalt, nickel and copper, as one of the great energy metals of the future and as a great opportunity with a lot of potential. E-mobility is on the rise and the prices for lithium, copper and nickel are skyrocketing. Lithium in particular is showing signs of a huge supply shortfall, as was recently outlined by Rio Tinto in an impressive presentation. The company estimates that current supply and promised production expansions can meet only 15% of demand growth through 2050. 85% will have to be met from other sources, i.e. new mines. It also fits into the picture that two of our former report companies (Millennial Lithium and NeoLithium) have received takeover offers from leading (Chinese) battery manufacturers this year.

What began with the founding of Tesla Motors is now unstoppable. The electric car is established and has won a place among consumers, also because politicians have recognized that a world that is as CO_2-free as possible will only be possible with electric mobility and are promoting this accordingly by means of start-up financing.

Lithium, nickel and cobalt are the main components of all batteries and accumulators available in large series and thus the main link of the electric vehicle dream. Interesting are the movements in Germany, where not only Tesla builds a factory (Gigafactory), but meanwhile several well-known battery manufacturers have pitched their tents.

All these factories will be enormous drivers of demand for lithium, cobalt and nickel, but also for copper. Millions of tons of copper will be needed in the future not only for cars, but especially for the charging infrastructure. 2020 was clearly the start of a decade for commodities, as they are – and will remain – the basis of everything we do economically. Supply will barely be able to keep up with the demand that will set in once the Corona virus is overcome.

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My team and I hope you enjoy reading the Battery Metals Special Report and we hope to provide you with lots of new information, impressions and ideas.

Yours, Jochen Staiger

Jochen Staiger is founder and CEO of Swiss Resource Capital AG, located in Herisau, Switzerland. As chief-editor and founder of the first two resource IP-TV-channels Commodity-TV and its German counterpart Rohstoff-TV, he reports about companies, experts, fund managers and various themes around the international mining business and the correspondent metals.

Tim Rödel is Manager Newsletter, Threads & Special Reports at SRC AG. He has been active in the commodities sector for more than 15 years and accompanied several chief-editor positions, e.g. at Rohstoff-Spiegel, Rohstoff-Woche, Rohstoffraketen, the publications Wahrer Wohlstand and First Mover. He owns an enormous commodity expertise and a wide-spread network within the whole resource sector.

The exit from the era of the combustion engine is accelerating! – High supply deficits are causing battery metal prices to go through the roof!

20 years after Tesla‘s founding, the market for electric vehicles is exploding

Almost 20 years after the founding of Tesla, the first commercial e-car manufacturer, the sector of electric locomotion has taken on a momentum hardly thought possible. There are already well over 200 electric car models on the market worldwide. By 2022, there will be over 500. In 2015, the number of new electric vehicles registered each year was only 450,000 worldwide. In 2020, the figure was 1.7 million. According to estimates by experts at Bloomberg, there will be 8.5 million in 2025, 26 million in 2030 and 54 million in 2040. Mind you, per year! At the beginning of 2021, there were 10 million electric vehicles on the roads worldwide. In 2030, according to the latest estimates, there will be over 130 million.

This requires large quantities of metals that have so far found little or much less use in conventional vehicles with internal combustion engines. These primarily include the battery metals lithium, nickel, manganese and cobalt, as well as copper and graphite. Yet even now, at an early stage when the electric revolution is just beginning to gain momentum, there is the threat of glaring supply bottlenecks that have caused the prices of most of these materials and metals to skyrocket in recent months. For investors, there is an excellent entry opportunity into the world of battery metals right now, as we will detail below.

The „electric revolution“ is picking up steam ...

Electric mobility is just one of many aspects of the electric revolution. Because the leap from the age of fossil combustion to the clean generation and use of electrical energy does not only concern the locomotion sector. The increasing decentralization of energy generation calls for intelligent solutions in terms of on-site storage of electrical energy, which is why the electric boom will not only be felt in the automotive sector from now on.

... especially in terms of mobility

Nevertheless, the automotive industry is clearly playing a pioneering role, as many countries have introduced measures to accelerate the move away from the combustion engine and towards the electric motor, particularly in order to achieve the climate targets they have set themselves.

Many cities, regions and countries are constantly outdoing each other with new, ever more ambitious targets for the phase-out of internal combustion engines. The EU Commission recently announced in October 2021 that the fleets of domestic car manufacturers are to emit no CO_2 at all from 2035, although many member states want to put the internal combustion engine to bed before then. Denmark, Ireland, the Netherlands, Sweden and Slovenia, for example, are aiming for 2030. Israel and Japan are also aiming for this goal, Norway even for 2025, followed by Scotland (2032), Canada and Thailand (2035), France, Spain and Egypt (2040) and China, which is aiming for CO_2 neutrality for its entire vehicle fleet by 2060.

Automakers plan to build many millions of electric vehicles

In the EU in particular, the end for many combustion engines is likely to come quite quickly and corresponding car manufacturers are already accelerating the switch to electric vehicles in order to be able to comply with the strict environmental requirements of the EU. The following plans are only to be seen as a basis, which will be increased year by year:

- **BMW:** By 2025, 15 to 25% of all vehicles produced are to be purely electric, which means a total of around 300,000 to 600,000 vehicles;
- The **Chinese automakers**, which now number more than 170, plan to put at least 4.5 million electric vehicles on the road starting this year;
- **Daimler**: Ten new electric models by 2022. 15 to 25% of all vehicles produced are to be purely electric by 2025, which means a total of around 300,000 to 600,000 vehicles;
- **Ford**: By 2022, at least 13 models are to be electrically powered, which is about 10 to 25% of the complete model range;
- **General Motors**: 20 new electric models by 2023 and complete conversion to electric mobility – timeframe still open;
- **Honda**: In 2030, two-thirds of all models are to run on electric motors – around 3.3 million as things stand today;
- **Hyundai**: At least 10% electric vehicle share by 2025 – 800,000 vehicles;
- **Peugeot**: 80% conversion to electric drive by 2023;
- **Porsche**: Conversion of 90% of the product range to electric drives;
- **Renault/Nissan**: 1.5 million vehicles from 2021;
- **Tesla**: 1 million vehicles as of now;
- **Toyota**: 50% conversion to electric drive and hybrid by 2030 ;
- **VW Group**: By 2025, 20 to 25% of all vehicles produced are to be purely electric, which means a total of around 2 to 3 million vehicles. By 2030, 300 electric models are to be launched on the market.

The lithium-ion battery will be the non-plus-ultra for many years ...

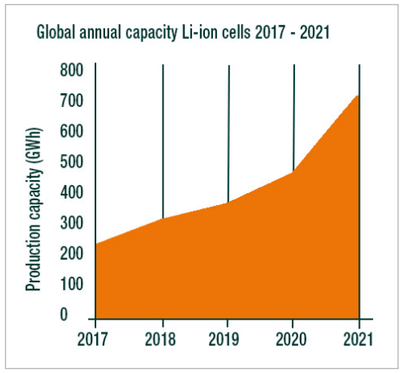
In addition to the engine, the heart of every electric vehicle is the energy storage unit, i.e. a rechargeable battery. In order to be operated economically in the long term, electric vehicles, but also increasingly emerging decentralized storage systems – such as for photovoltaic or wind power plants – require ever more powerful rechargeable batteries. The lithium-ion battery has now emerged as the clear favorite. One of the reasons for this is that within a lithium-ion battery, the voltage is achieved by exchanging lithium ions. Due to their high energy density, lithium-ion batteries provide constant power over the entire discharge period and do not exhibit any so-called memory effect, i.e. a successive loss of capacity after many years of use or frequent partial discharge. The name „lithium-ion battery“ is only the generic term for a whole range of possible chemical structures, such as the lithium-cobalt (dioxide) battery, the lithium-manganese (dioxide) battery, the lithium-iron phosphate battery and – less commonly – the lithium-titanate battery and the tin-sulphur lithium-ion battery. The most common is currently the lithium-nickel-manganese-cobalt (abbreviated NMC) battery.

... but the development continues steadily – away from cobalt, towards nickel!

Although the basic principle of the lithium-ion battery has not changed much over time, development continues. The main focus is on efficiency and charging capacity (electric vehicles are often referred to as range), but also on the use of metals and elements. In this respect, a transformation is currently taking place away from high proportions of cobalt (NMC 111, where the figures indicate the ratio of nickel, manganese and cobalt) towards a higher proportion of nickel (NMC 811), although development is currently still at the corresponding intermediate stages (NMC 622 / NMC 532). NMC 111 is considered the simplest battery version, based on an equal amount of atoms of the three elements, NMC 532/622 have a higher energy density and a lower price than NMC 111 due to a lower cobalt content and NMC 811 is the latest and most advanced battery version with the highest theoretical lithium and cobalt performance. It is precisely because of this trend towards higher nickel content that Tesla CEO Elon Musk literally begged relevant mining companies to develop new nickel mines in 2020.

Manufacturing plants (gigafactories) for rechargeable batteries and corresponding materials are mushrooming

While European and North American production pipelines have grown significantly over the past 18 months, China remains by far the most aggressive country in building lithium-ion cell production capacity to support its electric vehicle and energy storage industries. Currently, about 150 of the world's roughly 200 manufacturing facilities, or „gigafactories," are in the pipeline in China, while Europe and North America have only about 20 and 10 gigafactories in the pipeline, respectively. Globally, about 130 gigafactories are already in operation, of which only 6 are producing in the EU. Global lithium-ion cell production capacity is expected to reach 740 GWh by the end of 2021 – almost triple the 2017 level – with Europe responsible for only 8% or 62 GWh of the total.



(Source: own representation)

Asia dominates the battery sector

China alone provides a large share of the total demand for lithium-ion batteries today. China is expected to continue to see the strongest annual increase in lithium and cobalt demand of all major market players over the next 5 to 10 years, largely due to an expected multiplication in the number of units of rechargeable batteries. Other key suppliers of lithium-ion batteries, including South Korea and Japan, are also expected to guarantee robust growth in lithium and cobalt demand. Foremost among these are electronics giants Panasonic, Samsung, LG Chem, BYD, Boston Power, Lishen, CATL, Dynavolt, and Great Wall.

The EU is now really stepping on the gas!

The EU, which seemed to sleep through the development of battery production for years, has been able to catch up with China thanks to many governmental and private subsidy programmes and not least thanks to its strong industrial base.

Tesla's Gigafactory near Berlin and Northvolt's Gigafactory in Skellefteå in northern Sweden are just a taste of what is to come in the next 10 years. By 2030 alone, more than 25 corresponding production sites for batteries and/or cathode materials are planned. At the same time, a planned battery capacity of at least 660 GWh by 2030 is currently being considered.

North America is Tesla country

In North America, Tesla holds the dominant position in lithium-ion battery production. The company has been operating the so-called „Gigafactory 1" in Nevada since 2016. Lithium-ion batteries, battery packs, electric motors and drive units for up to 500,000 electric vehicles per year are built there. Gigafactory 5" is currently under construction in Texas.

Further gigafactories are in the making in North America

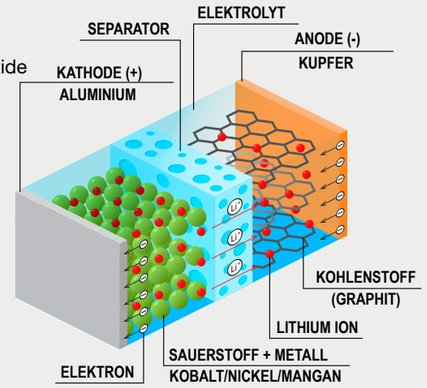
Tesla is far from the only lithium and cobalt consumer planning major lithium-ion battery production. LG Chem already started production for Chevy in Michigan in October 2015. Foxconn, BYD (the world's largest producer of rechargeable batteries, especially for mobile phones), Lishen, CATL and Boston Power are also working on the construction of their

Composition and operating principle of a lithium-ion accumulator

Composition of a lithium-ion accumulator

Essentially a lithium-ion accumulator consists of the following components and materials:

- **Positive electrode (cathode):**
  Lithium-Cobalt(III)-oxide
  Lithium-Nickel-Manganese-Cobalt-Oxide
  Oxygen
  Aluminum as conductor material
- **Negative electrode (anode):**
  Graphite or related carbon materials
  Silicon
  Tin dioxide
  Copper as conductor material
- **Electrolyte (solution)**
- **Polymer membrane separator**



Functionality of a lithium-ion battery

In simple terms a lithium-ion accumulator generates an electromotive force by the movement of lithium-ions. During charging the positive lithium-ions migrate through the electrolyte and the separator from the positive to the negative electrode. In the process the lithium-ions can move freely between the two electrodes through the electrolyte within the accumulator. Unlike the lithium-ions the transition metal and graphite structures of the electrodes are stationary and protected by a separator from a direct contact. The mobility of the lithium-ions is necessary for the compensation of the external current during recharging and discharging so that the electrodes stay largely electrically neutral. The negative electrode is a so-called graphite intercalation compound where lithium exists as cation. During discharge the intercalation compound emits electrons which flow back to the positive electrode viathe extern circuit. Simultaneously many Li+ ions migrate from the intercalation compound through the electrolyte also to the positive electrode. At the positive electrode the lithium-ions do not receive the electrons of the external circuit but the present structures of the transition metal compounds. Depending on the type of accumulator these are cobalt, nickel, manganese or iron ions that change their charge.

own gigafactories, including for so-called power banks, i.e. decentralised electricity storage systems, which are likely to become increasingly important in the future.

Lithium-ion batteries are the current state of the art and market leader

In addition to the already mentioned raw materials lithium, cobalt, nickel and manganese, a lithium-ion battery mainly consists of aluminium, copper, graphite, zinc, tin, silver and steel. The majority of (lithium-ion) batteries currently on the market are lithium-cobalt (di-oxide) batteries, which is why this report is primarily concerned with the battery metals lithium, nickel and cobalt. We will also take a look at copper, which is becoming increasingly important.

Lithium

The element lithium

Lithium is a light metal from the group of alkali metals. It has the lowest density of all known solid elements. It is only about half as heavy as water, naturally silvery white and relatively soft. Lithium is highly reactive, which is why it basically always occurs as a lithium compound in the wild. It tarnishes rapidly in air, due to the formation of lithium oxide and lithium nitride. In pure oxygen it burns with a bright red flame at 180°C to form lithium oxide. Lithium reacts very strongly with water to form lithium hydroxide.

Lithium extraction is either lengthy or expensive

Global lithium production is divided into several different branches, producing the following types of lithium compounds:

1. Lithium carbonate,
2. Lithium hydroxide,
3. Lithium chloride,
4. Butyllithium and
5. Lithium metal.

Metallic lithium is usually produced from lithium carbonate in a multi-stage process and is usually traded with a purity of 99.5%. This metallic lithium is used as a catalyst in the chemical and pharmaceutical industries as well as for the production of aluminium-lithium alloys.

The industry essentially distinguishes between three types or qualities of lithium compounds:

1. „Industrial Grade“, with a purity of over 96%, mainly for glass, casting powder and lubricants,
2. „Technical Grade“, with a purity of about 99.5%, mainly for ceramics, lubricants and batteries, and
3. „Battery Grade“, with a purity of over 99.5%, mainly for high-end cathode materials in batteries and rechargeable batteries.

There are two types of lithium deposits

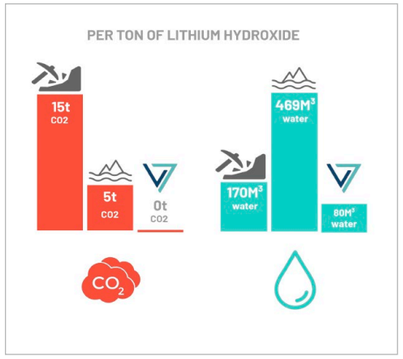
Lithium is generally obtained from two different sources.

1. So-called „brine“, i.e. (salt) sheet or brine deposits: Mainly in salt lakes, lithium carbonate is extracted from lithium-containing salt solutions by evaporation of the water and addition of sodium carbonate. To obtain metallic lithium, the lithium carbonate is first reacted with hydrochloric acid. This produces carbon dioxide, which escapes as a gas, and dissolved lithium chloride. This solution is concentrated in a vacuum evaporator until the chloride crystallizes.
2. So-called „hard rock spodumene“, i.e. hard rock pegmatite deposits: Here, lithium compounds are not extracted from lake salt, but from spodumene, a lithium-bearing aluminum silicate mineral. Extracted using conventional mining technology, the concentrate obtained is often converted to lithium carbonate with a purity of more than 99.5%. The intensive thermal and hydrometallurgical process required for this is considered to be very costly. Such deposits are currently exploited almost exclusively in Australia, with most of the further processing taking place in Chinese facilities.

Water consumption versus CO_2 emissions

The two sources (brine deposits/hard rock deposits) each have opposite advantages and disadvantages with regard to the extraction of lithium. While the extraction of one ton of lithium hydroxide from brine deposits requires about 469 cubic meters of water, one ton of lithium hydroxide from hard rock deposits requires only about 170 cubic meters of water. The opposite is true for the CO_2 balance. While the extraction of one ton of lithium hydroxide from brine deposits only produces about 5 tons of CO_2, the extraction of one ton of lithium hydroxide from hard rock deposits produces about 15 tons.

The question is: What weighs more with the battery and car manufacturers? And CO_2 neutrality seems to have the edge here. By the way, currently about 60% of all lithium hydroxide mined worldwide is extracted from hard rock deposits and only 40% from brine deposits.



(Source: Vulcan Energy)

New processing methods and lithium sources give hope

Recently, more and more exploration and development companies have been focusing on new technologies, with the help of which it should be possible to extract lithium from brine deposits within days and even hours instead of using natural evaporation. The processes of Tenova Bateman and IBC Advanced Technologies are worth mentioning in this context.

In addition, several lithium development companies have identified a third lithium source. There is the possibility to extract lithium from old, exploited oil reservoirs. The lithium is extracted from the wastewater remaining in the reservoirs. The fact that this process works has already been proven several times. In addition, this unusual lithium extraction process also appears to be economically feasible. Thus, brine-containing (former) oil fields are also becoming a focus of the lithium industry.

The largest lithium carbonate production currently occurs in the Salar de Atacama, a salt lake in the northern Chilean province of Antofagasta.
(Source: Francesco Mocellin, CC BY-SA 3.0)

Larger lithium deposits exist only in a few regions

Lithium makes up about 0.006% of the Earth's crust and is slightly less abundant than zinc, copper and tungsten and slightly more abundant than cobalt, tin and lead. Estimates from the U.S. Geological Survey suggest that about 21 million metric tons of lithium are recoverable as reserves and 86 million tons are recoverable as resources worldwide. About 53% of the reserves in the South American countries of Chile and Argentina alone. The largest lithium carbonate production currently occurs in the Salar de Atacama, a salt lake in the northern Chilean province of Antofagasta. However, about 49 percent of global lithium production of about 82,000 metric tons in 2020 came from Australia, but at a much higher cost than in South America, which is why Australian production has declined sharply recently. Furthermore, significant lithium deposits are mainly found in North America and China.

Lithium production is currently concentrated in a few countries and companies

Australia, Chile, China and Argentina currently account for around 95 percent of the world's total lithium production, which is shared among only a few companies. As a result, the entire lithium market is very intransparent, which is why the large battery and accumulator manufacturers, such as Panasonic, have recently relied primarily on long-term supply contracts with relatively small development companies, some of which will not produce before 2023. As a result of this supply oligopoly, lithium is also not currently traded on the stock exchange, and the actual trading prices are kept strictly confidential. One reason for this, which the few suppliers always like to give, is that the available and required lithium qualities are too different for a standardized exchange trading place.

Main applications are alloys, lubricants and accumulators

Its above-mentioned special and versatile properties make lithium a sought-after material in many different areas of application. It should therefore come as no surprise that the main area of application for lithium has changed constantly in the past. Initially used mainly in medicine, the element began its triumphant advance in the 1950s as a component of alloys. Its low weight, but also its positive properties in terms of tensile strength, hardness and elasticity, made it an integral part of aerospace technology in particular. In the past 20 years, this picture has changed once again. In the course of the beginning electric revolution, it was recognized quite quickly that it is almost perfectly suitable as anode in batteries due to its low normal potential. Lithium batteries are characterised by a very high energy density and can generate particularly high voltages. However, lithium batteries are not rechargeable. Lithium-ion batteries, on the other hand, have this property, in which lithium metal oxides such as lithium cobalt oxide are connected as the cathode. As a raw material for the production of accumulators and batteries, however, higher purity grades than 99.5% are required. Lithium hydroxide in the „Industrial" grade is used, among other things, as a raw material for lubricants and coolants. With the higher „Technical" grade, it is also used in the production of rechargeable batteries and batteries. Lithium carbonate – crystalline, granulated or as powder – is used, for example, in the electrolytic production of aluminum, in the ceramic and pharmaceutical industries, and in alloying technology. Special purity grades of lithium carbonate in the form of very fine powder (battery grade powder) are suitable as a raw material for the production of lithium-ion batteries. The extraction and processing of (especially high-grade) lithium is considered very costly.

The manufacture of lithium-ion batteries requires a large amount of lithium

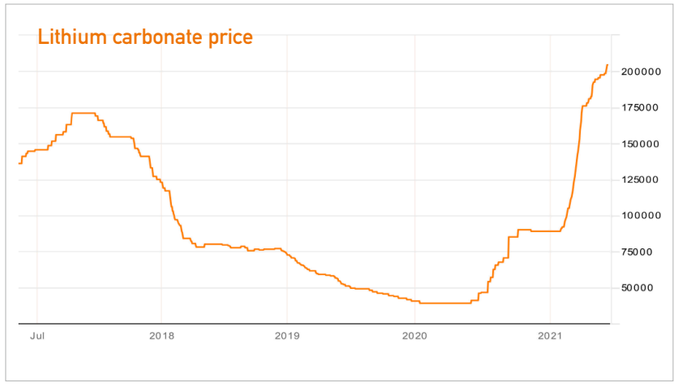
A large amount of lithium is required for the production and operation of lithium-ion batteries. Each smartphone contains between 5 and 7 grams of LCE (lithium carbonate equivalent). For a notebook or tablet, the figure is 20 to 45 grams. Power tools such as cordless screwdrivers or electric saws require about 40 to 60 grams for their batteries. A 10 KWh storage unit for domestic use requires about 23 kilograms of LCE, while batteries for electric cars require between 40 and 80 kilograms. An energy storage system with a capacity of 650 MWh needs about 1.5 tons of LCE.

Lithium production will (and must) increase sharply

In 2020, global lithium production was around 430,000 tonnes LCE. Projections assume that this figure could rise to a maximum of about 580,000 tonnes LCE with today's mining activity, whereby only very few efforts for concrete mine expansions or new mines have been made so far, so that lithium is practically running into a huge supply deficit. In addition to this, recent reports about several postponed mine starts caused additional uncertainty on the supply side.

The decisive factor is always the price, but this is relatively insignificant for battery production!

Ultimately, it is the price alone that determines the economic recoverability of the existing lithium deposits. While the price was still around US$6,000 per tonne of lithium carbonate in mid-2015, it recently shot up to around US$30,000 (200,000 yuan). It can be assumed that this will settle between US$12,000 and US$18,000 per tonne of lithium carbonate in the medium to long term. Either way, this is a lucrative business for the producers, as the pure extraction costs for the current projects are only around US$ 2,000 (Chile) to



Lithium carbonate price in yuan/tonne
(Source: own representation)

US$ 7,000 (China) per tonne. This is similarly the case with lithium hydroxide. Since lithium makes up a considerable part of a battery in terms of volume but is only responsible for about 4-5% of the costs of a battery, the lithium price is ultimately relatively insignificant for the production of lithium-ion batteries and should therefore be able to be maintained at an economic level for the lithium producers.

Demand for lithium is increasing rapidly – high supply deficit foreseeable from 2023!

The demand for lithium appears to be almost gigantic, not only due to, but especially because of the new boom sector of electromobility! While in the case of lithium this was still around 65,000 tonnes of LCE in 2000, by 2020 it was already 305,000 tonnes of LCE that were in demand per year. By 2022, experts expect LCE demand to rise to over 500,000 tons, and by 2025 to over 800,000 tons per year.

The main driving factor will be demand from the battery and accumulator sector and the associated automotive industry. Assuming that a maximum of 580,000 tonnes of LCE can be extracted per year from existing mines and that new mines cannot be commissioned in the short term, a supply deficit of well over 200,000 tonnes is indicated for 2025 alone! For 2030, the outlook is even bleaker. A bottleneck of unimagined proportions is looming here.

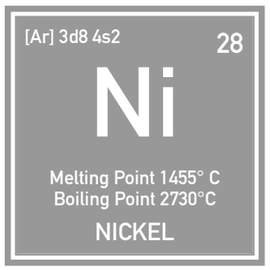
Nickel

The element nickel

Nickel is a metallic, silvery shiny transition metal. It is medium hard, malleable and easy to polish. Like cobalt, nickel is ferromagnetic and also highly resistant to air, water, hydrochloric acid and alkalis at room temperature, which makes it ideal for use in lithium-ion batteries.

Extraction

Most of the nickel is extracted from nickel- and copper-bearing iron ores. By means of a multi-layer process, copper-nickel fines, which consist of about 80% copper and nickel and about 20% sulfur, are produced. To obtain the crude nickel, the nickel must be separated from the copper. To obtain pure nickel, the crude nickel is electrolytically refined. The purity of electrolytic nickel is about 99.9%.



Occurrence and production

Nickel occurs in the earth‘s crust with a content of about 0.008%, i.e. with about twice the amount of cobalt and somewhat more frequently than lithium. Solid nickel, i.e. nickel in elemental form, occurs only rarely. As of 2020, only about 50 occurrences of native nickel were known worldwide. The most important deposits are found in Canada, New Caledonia, Russia, Australia and Cuba.

The majority of nickel production comes from sulphide ores. In addition, lateritic nickel ores are also mined as raw materials for nickel production. Due to the exploitation of the classic sulphide deposits, extraction is increasingly shifting towards lateritic nickel ores, which, however, means more expensive extraction.

In 2020, around 2.5 million tonnes of nickel were mined worldwide. The largest producer was Indonesia with about 760,000 tons. However, the country imposed an export ban on nickel at the beginning of 2020, mainly to promote its own stainless-steel industry and to conserve its own resources. Other major producers include the Philippines (320,000 tonnes), Russia (280,000 tonnes) and New Caledonia (200,000 tonnes). These countries are responsible for around 60% of total nickel production worldwide.

Main application: steels and nickel alloys

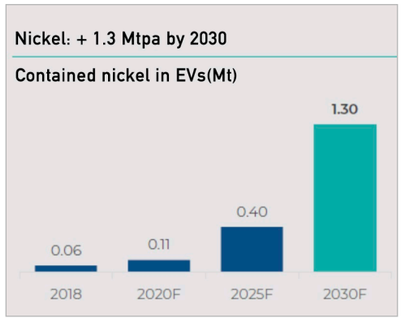
Most of the annual nickel production (about 85%) goes into the production of stainless steels and nickel alloys. Nickel is one of the most important alloying metals, mainly used for steel refining. It makes steel corrosion resistant and increases its hardness, toughness and ductility. Steels highly alloyed with nickel are used in particularly corrosive environments. About 20% of the nickel mined is used to produce nickel alloys such as constantan, nickel silver and monel.

Other uses

Pure nickel metal is used in finely divided form as a catalyst in the hydrogenation of unsaturated fatty acids. Due to its chemical resistance, nickel is used for apparatus in chemical laboratories and the chemical industry, such as nickel crucibles for digestions. Nickel alloys, for example for coins, are made from nickel metal. Nickel-based superalloys are alloys specially designed for use at high temperatures and under corrosive media. They are used, for example, in aircraft turbines and gas turbines in power plants.

High purity nickel for accumulators and batteries

So-called class 1 nickel with a purity of at least 99.98% is required for batteries and rechargeable batteries. Only about 45% of the total nickel production of about 2.4 million tons per year is suitable for the production of class 1 nickel. Of this, more than half is required for alloys and other applications. Less valuable class 2 nickel is used exclusively in steel production.

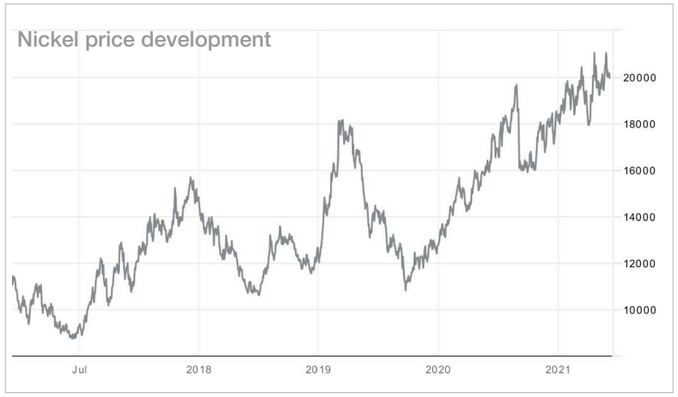


Nickel contained in millions of tons
(Source: Canada Nickel)

The development from cobalt- to nickel-dominated batteries further promotes the supply deficit

Due to the fact that the development of lithium-ion batteries is increasingly moving from cobalt to nickel-dominant cathode materials and the required quantities will increase sharply, especially in the automotive sector, an expansion of an already existing supply deficit can be expected in the coming years. This has already been the case for the nickel market as a whole since 2016. For class 1 nickel, such a supply deficit is expected from

2023 at the latest, with a strong upward trend. For 2030, a shortfall of 900,000 tonnes of nickel is expected. By 2040, the supply deficit is expected to widen to 2 million tonnes per year, including new nickel projects. It is estimated that demand for nickel from the automotive sector will increase more than tenfold from 110,000 tonnes in 2020 to 1.3 million tonnes in 2030.



Nickel price development over the last 5 years
(Source: own representation)

A severe supply deficit is inevitable, first signs are already noticeable

A taste of what may be to come was provided by LME inventories, which fell from around 400,000 tonnes to around 60,000 tonnes from the start of 2018 to the end of 2019. At the same time, the nickel price rose by about 60% during this period to around US$18,000 per metric tonne. The Corona crisis then saw inventories rise again to around 260,000 tonnes, only to collapse again to below 120,000 tonnes recently. All in all, it looks as if nickel and the corresponding producers and developers will be the next big beneficiaries of the electric (mobility) boom! It is not for nothing that Elon Musk called nickel the „New Gold“ in the middle of 2020 and literally begged mining companies to develop new nickel mines.

Cobalt

The element cobalt

Cobalt is a steel-grey, very tough heavy metal (ferromagnetic transition metal) with a density of 8.89 g/cm3. As a typical metal it conducts heat and electricity well, the electrical conductivity is 26 percent of that of copper. In chemical behavior it is similar to iron and nickel, resistant to air by passivation; it is dissolved only by oxidizing acids.

Cobalt extraction is relatively simple and inexpensive

Cobalt extraction is a well-known, relatively simple process. Cobalt is mainly extracted as a by-product from copper and nickel ores. First, part of the existing iron sulfides is converted into iron oxide by roasting and slagged with silicon dioxide as iron silicate. This produces the so-called crude stone, which contains nickel, copper and other iron as sulphide or arsenide in addition to cobalt. Further sulphur is removed by further roasting with sodium carbonate and sodium nitrate. In the process, sulfates and arsenates are formed from some of the sulfur and arsenic, which are leached out with water. The corresponding metal oxides remain, which are treated with sulphuric or hydrochloric acid. Only copper does not dissolve, while nickel, cobalt and iron go into solution. With chlorinated lime, cobalt can then be selectively precipitated as cobalt hydroxide and thus separated. This is converted to Co_3O_4 by heating and then reduced to cobalt with coke or aluminium powder.

Most of the cobalt deposits are probably under the seabed

Cobalt is a rare element with a frequency of 0.004 percent in the earth‘s crust. This makes it the thirtieth most abundant element in the list. Cobalt is found in many minerals, but usually occurs only in small amounts. The element is always associated with nickel, often also with copper, silver, iron or uranium.
The world‘s known cobalt resources are about 25 million tonnes, with the largest deposits in the Democratic Republic of Congo, Zambia, Canada, Morocco, Cuba, Russia, Australia, Uganda and the USA. Over 100 million tonnes of cobalt are believed to be present in the Earth‘s crust on the floors of the Atlantic, Pacific and Indian Oceans.

Cobalt production mainly takes place in „problematic“ regions

The majority of the annual cobalt production of 140,000 tonnes comes from mines in the Democratic Republic of Congo. About 70% of the total production volume came from the Central African civil war country in 2020. Russia accounted for another 4.5% at last count, the Philippines for 3.35% and China for 2.6%. All countries that are not necessarily considered to inspire confidence. The remaining production is divided between Canada (just under 2.3%), Australia (4%), South Africa (1.3%) and several other countries with even lower production volumes.

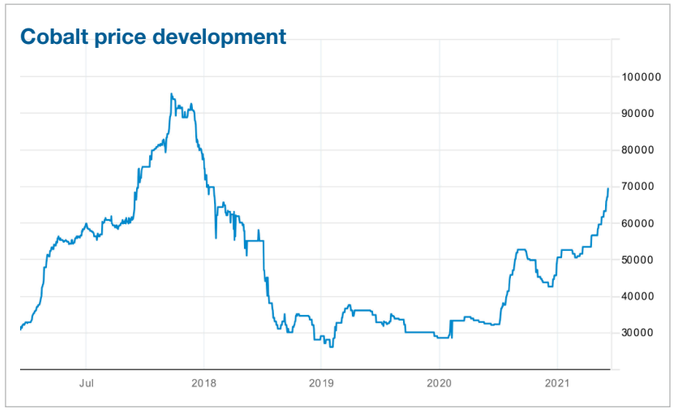
The future security of supply appears to be extremely critical on the basis of current producers, which is why more and more attempts have been made recently to develop new mines and increase production accordingly, especially in Canada, Australia, the USA and Finland.

Main applications are paints, alloys, medicine, magnets and rechargeable batteries.

Historically, cobalt has been used in the form of oxides, sulfates, hydroxides or carbonates for heat-resistant paints and pigments. Probably the best-known decorative application is blue cobalt glass. Today, cobalt is used primarily as an alloying component to increase the high-temperature strength of alloyed and high-alloy steels, especially high-speed steel and superalloys, as a binder phase in hard metals and diamond tools, as a component of magnetic alloys, as a drier for paints and varnishes, as a catalyst for desulfurization and hydrogenation, as a hydroxide or lithium cobalt dioxide ($LiCoO_2$) in batteries, in corrosion- or wear-resistant alloys, and as a trace element for medicine and agriculture. Cobalt is also used in the production of magnetic data media such as audio and video cassettes, where it improves the magnetic properties through doping. Since the 1990s, cobalt has served as an anode material in the anode of lithium-ion batteries.

Electric vehicles in particular require a lot of cobalt – but not only them

Similar to lithium, cobalt is also consumed in the corresponding batteries. Depending on the model, between 5 and 10 grams of cobalt are used in a single smartphone. A notebook or tablet contains between 30 and 100 grams. Power tools need about 50 grams for their batteries. A 10 KWh storage unit for home use (such as Tesla‘s Powerwall) requires about 7 kilograms of cobalt, while the batteries for hybrid vehicles need about 4 kilograms and for pure electric cars 10 kilograms of cobalt. Tesla‘s Model S comes in at as much as 22.5 kilograms. A passenger plane gobbles up about 4,000 kilograms of cobalt.



Cobalt price development (US$/ton) over the last 5 years
(Source: own representation)

Cobalt supply must be increased

An increase in supply is urgently needed, because the lithium-ion battery sector will demand ever larger quantities and thus ever larger quantities of cobalt in the coming years – even if the further development of batteries suggests that cobalt will increasingly be replaced by nickel. While annual production in 2016 was still around 123,000 tonnes, leading experts believe that it will be difficult to expand production above 150,000 tonnes per year with the current mines. The fact is that Congo will nevertheless remain the absolute world market leader for the time being and will even expand its market share to over 70%. The two largest cobalt mines in the world, Kamoto and Kolwezi, which alone can produce about 50,000 tonnes of cobalt per year, have a large share in this. Outside Congo, several companies are working on expanding their existing mines (including Glencore, Norilsk, Umicore, Sumitomo and Vale), but these mine expansions are likely to be only a drop in the ocean due to the expected increase in demand.

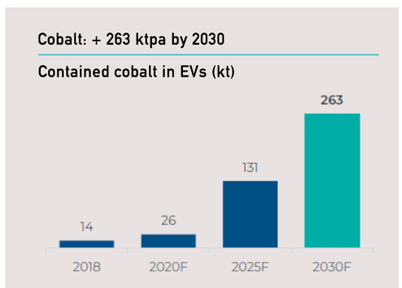
The cobalt price gives a taste of things to come!

Many market participants have already realised that cobalt production cannot be expanded quite so easily from one day to the next, which is why the cobalt price has exploded from around US$ 5,000 to almost US$ 100,000 per metric ton since mid-2016 and currently stands at around US$ 70,000 per metric ton. A similar increase can be expected as soon as the leading carmakers drastically expand their model range.

Cobalt will experience an immense demand surge and supply deficit in the coming years!

The demand for cobalt will almost certainly explode in the coming years! While this was still around 60,000 tonnes in 2008, in 2017 it was already 125,000 tonnes that were demanded per year. By 2025, experts expect cobalt demand to rise to over 270,000 tons per year.

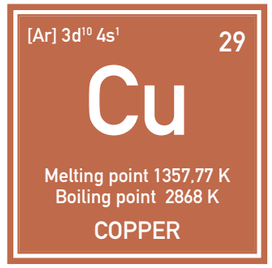
The main driving factor will be demand from the battery sector. Experts estimate that demand for cobalt from the automotive sector alone will increase from 26,000 tonnes in 2020 to up to 130,000 tonnes in 2025 and 263,000 tonnes per year in 2030 (again for comparison: total annual global production in 2020 was 140,000 tonnes). Due to the current situation that demand is rising sharply, but at the same time only a few existing mines even have the ability to ramp up their production, a huge supply deficit is looming for cobalt in the coming years. This deficit is likely to gradually widen and exceed the 10,000 tonnes per year mark by 2022.



Nickel contained in millions of tons
(Source: Canada Nickel)

Copper

Although copper is not a classic battery metal, nothing works without the red metal in the implementation of the electric revolution. Copper has the characteristic of being the most conductive of all known metals after characteristic silver. And without a reliable connection between the individual electrical components, a world of electromobility and electrical storage cannot function.



The element copper

Copper is a chemical element with the element symbol Cu and the atomic number 29. Like silver and gold, it is one of the transition metals that occur naturally in pure form, i.e. in elemental form. The name copper comes from the Latin cuprum, which is derived from Cyprus, where the most important copper mines were located in ancient times. It is the 26th most common element in the earth‘s crust (share of about 0.006 %) and has been mined for about 7,000 years. Copper has a reddish luster and being a relatively soft metal, is easily malleable and ductile. It has a very high thermal and electrical conductivity.

The deposits are quite concentrated, the extraction simple

There are several thousand sites around the globe. Significant copper production, however, exists in only a few regions. Chile was by far the most recent leader in copper production, with an annual production of 5.7 million tons in 2020. This was followed by Peru (2.2 million tonnes), China (1.7 million tonnes), the USA (1.2 million tonnes) and the Democratic Republic of the Congo, also with 1.2 million tonnes. These five countries together account for about 60% of the world‘s production of about 20 million tonnes per year. The top 10 copper producing nations also include Australia, Zambia, Russia, Mexico and Indonesia. China (9.8 million tonnes) is by far the leading smelter. In addition, there is recycled copper of about 900,000 tonnes.

Copper is extracted by smelting and refining. The corresponding processes have been mature for a long time, the processing is correspondingly simple and relatively inexpensive.

Main features: High thermal and electrical conductivity, soft, antibacterial, red

By far the most important ability of copper is its high electrical conductivity. Its conductivity is only slightly worse than silver and significantly better than gold, but copper is far less expensive than the other two metals. Since all admixtures dissolved in copper, especially impurities such as phosphorus and iron, greatly reduce its conductivity, the highest degrees of purity are often sought for conductor materials. Its softness and red colour also make it interesting for the jewellery and art industries, for example in the form of alloys (brass, bronze, nickel silver, red gold). In addition, it has an antibacterial, partly antiviral effect and can render bacteria, viruses and fungi harmless within a few hours.

Main fields of application: Electrical engineering, piping, art, construction

By far the largest application area for copper is electronics and electrical engineering as well as piping, i.e. infrastructure. Among other things, it is used for electrical cables, switching wires, power cables, overhead lines, conductors on printed circuit boards, wire windings in transformers, chokes/coils and in

Copper price development over the last 5 years (Source: own presentation)

electric motors. Furthermore, as cable connection between electrical components like accumulators, motors and applications. Further applications are water piping, roofing, glass coatings, tableware as well as in arts and crafts for the production of printing plates for copper engravings and etchings and in the jewellery sector for alloys.

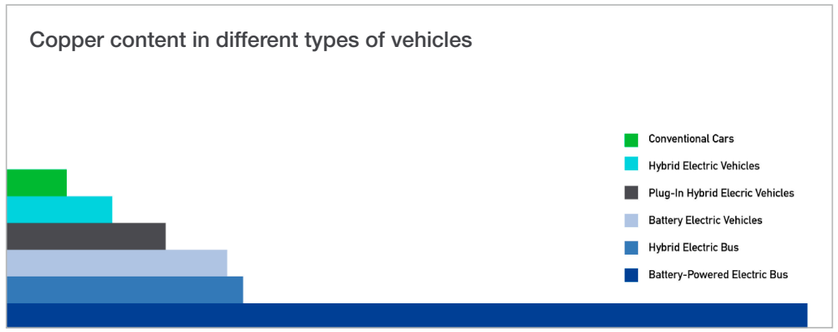
Supply deficit already exists de facto – expansion very likely

The International Copper Study Group calculated a supply deficit of about 300,000 tonnes for 2020. Due to the fact that more and more copper will flow into electromobility in the future (an electric car requires about 90 to 100 kilograms of copper, while a combustion vehicle often gets by with 20 kilograms), but also into the connection of regenerative power generators to the electricity grid (an onshore wind power plant requires about 5,4 tonnes of copper per megawatt, an offshore wind power plant even 15.3 tonnes of copper per megawatt), experts reckon that by 2035 there will be a gap of no less than 15 million tonnes per year, i.e. about 75% of current production. Furthermore, infrastructure and electric vehicle subsidy programs of many governments are likely to lead to a further boom in demand for copper. Experts expect copper demand from the automotive sector alone to increase tenfold from 300,000 tonnes in 2020 to 3 million tonnes per year by 2030.

(source: Canada Nickel)

Mining activities can no longer meet higher demand

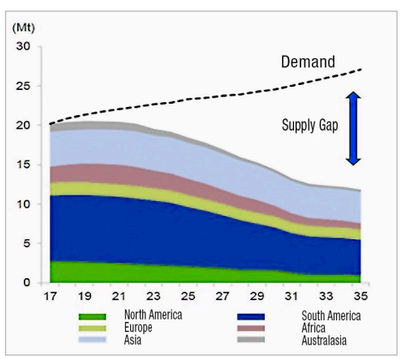
In addition to an expected increase in demand from the current level of about 20 million tonnes of copper per year to 25 million tonnes in 2030 and 28 million tonnes by 2035, copper production with the current mines is expected to decline to about 13 million tonnes at the same time. This is because at present it is mainly the expansion of existing mines that accounts for the bulk of new copper production, which is expected to come on stream by 2025. After that, new projects will be needed to close the growing gap that analysts expect. However, this will require significant investment. Many copper projects benefit from the production of valuable by-products such as gold, silver, cobalt and molybdenum, without which copper production would often not even be possible, i.e. profitable. Another aspect is the lack of exploration for large copper projects, which has been extremely sparse over the past ten years.



(Source: own presentation)

There must be a (further) upward adjustment of the copper price

As a result, there is currently a shortage of high-quality development projects. Since the quality of many new copper projects is much worse than that of current mines, an increase in production, i.e. the exploitation of poorer quality mines, can only succeed by adjusting the price. Copper speculators have recently realised that this is the case and have caused the copper price to break out to the upside, specifically above US$ 10,000 per tonne. Nevertheless, there are already signs of a further increase in the copper price, as the explosion in demand cannot even be nearly compensated for by the increase in supply.



Copper supply deficit (Source: own presentation)

Conclusion: The electric revolution is still in its infancy and will lead to a price explosion for battery metals

The demand for lithium, cobalt, nickel and, to a lesser extent, copper will be determined by three different parties in the future:

1. From the Asian electronics companies, which are mainly targeting the mass production of powerful lithium-ion batteries and accumulators for daily use, in multimedia devices, etc..

2. From the car manufacturers and (initially) first and foremost from Tesla Motors, but also from almost all established car manufacturers worldwide.

3. From the manufacturers of decentralized energy storage systems, which are used wherever electricity is generated by photovoltaic or wind power plants and is to be used later by means of storage.

This constellation will cause demand for lithium, cobalt and nickel to increase many times over in the coming years, and for copper it will also increase sharply, with decentralised storage facilities in particular generating the greatest growth in demand and likely to dwarf even the other two sectors.

A look at the most important number estimates is basically enough to come to this conclusion. The number of electric vehicles will

multiply in the coming years: From 1.2 million electric cars in 2017 to at least 20 million electric vehicles per year starting in 2025. From 2030 onwards, 25 million electrically powered vehicles can be expected annually, and from 2040 onwards even 60 million vehicles per year. In parallel, lithium-ion battery demand increases from 21 GWh in 2016 to 1,550 GWh in 2028! In 2020, capacity was an estimated 250 GWh, driven by expansions from upcoming giants LG Chem, Samsung SDI, CATL, Lishen, Tesla and others.

Procurement from dubious sources as well as China‘s market power in reprocessing

In the EU and thus also in Germany, lithium, cobalt and graphite belong to the so-called „red group“, i.e. materials with a very high supply risk. For the most part, they come from countries with dubious mining methods or high political risk. In addition to the actual procurement risk, issues such as a lack of environmental compatibility or a lack of social acceptance also play a role here. Another crucial point is that China currently controls a large part of the cobalt and lithium processing. A circumstance that will either lead to more projects outside China‘s sphere of influence or to higher prices in the future. Recycling does not play any role at the moment and therefore cannot be seen as a source of needed materials.

The imminent supply shortfall in all battery metals will mainly reward the far advanced developers

Overall, there are signs of a supply deficit in the near future for the lithium, cobalt, nickel and copper markets, as the increase in demand is likely to (far) exceed the expansion in supply in the future. In this context – due to the ongoing Corona crisis and the associated expectation of additional purchase incentives for electric vehicles – it is now assumed that the supply shortage will be brought forward from around 2025/26 to 2023. This is strongly indicated by recent reports of projects stalling, production being curtailed, and expansion plans being delayed.

As there is no end in sight to the increase in demand beyond 2025 and, moreover, there are no major production projects worth mentioning in the pipeline, this situation is likely to persist for the foreseeable future.

Especially the development companies, which have already advanced their respective projects, should offer the greatest share price opportunities in the coming months, also with regard to a possible consolidation, i.e. through takeover scenarios.

Some of these committed development companies, but also prospective producers, are presented below.

The number of electric vehicles will multiply in the coming years
(Source: Hookyung Lee, Pixabay)

Interview with Tobias Tretter –
Managing Partner of Commodity Capital AG

Mr Tretter, the lithium sector is really picking up again. Is this a sustainable trend or just a short-term flash in the pan? And what is the difference to the last bull market in 2018?

We believe that the current trend is very sustainable and that we are probably only at the beginning of a long-term cycle. Electromobility is only at the beginning of a new era, and it will take many years for the industry to adapt to the change in demand.

The current situation also cannot be compared to the rise and subsequent collapse of lithium prices through 2018. The price increase at that time was primarily a reaction to the expansion of refining capacity in China. Refining capacity in China expanded significantly from 2016 to 2018 and after there was initially not enough lithium concentrate, prices jumped, only to subsequently collapse as additional supply from Australia entered the market and already planned refinery expansions were put on hold. We do not see the situation as comparable at the moment. Prices are currently rising significantly worldwide, and the reason is a demand for lithium that is significantly higher than the supply. Or let me put it this way: The demand for lithium has surprised the market and the supply is nowhere near able to keep up with the increased demand. There has been too little investment in the lithium sector, and it will take years to make up for the last few „sleepy“ years. After years without significant new investment, there was still $2.8 billion invested in 2020 and $3.6 billion so far this year. However, it will take significantly more investment to clear the deficit in the market. At least another USD 14 billion in new investments will be needed by 2025, and we estimate that this figure is still too low.

There are currently over 200 new mega-factories for new batteries under construction or in planning, and we expect that several more will need to be built in the coming years to meet demand. These 200 new factories alone will require more than 3 million tonnes of lithium – 7 times the amount currently produced worldwide.

Which battery metals will play the most important role in the future and why?

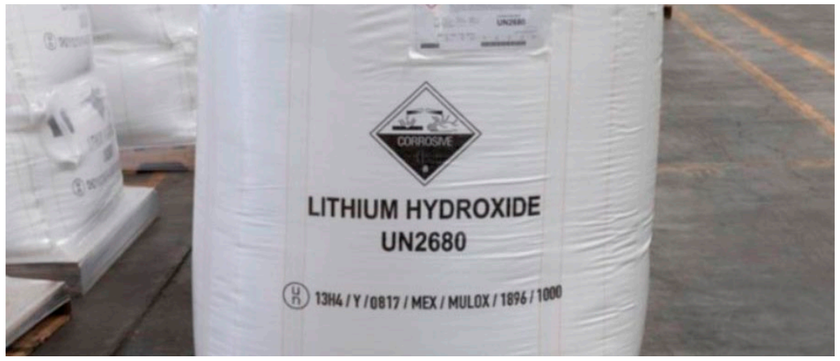
The most important battery metal is and will continue to be lithium. Lithium is the main component regardless of the composition and technological advances of batteries and we do not see any efforts on the part of the industry to replace lithium. The situation is different with cobalt. Cobalt will play an increasingly insignificant role in future batteries and will disappear completely with solid-state batteries at the latest. However, the situation is different for manganese and especially for nickel. Both will play a much more important role in the coming battery generations. However, it is also important to know that most nickel and manganese production is consumed in the steel industry and that the nickel and manganese used here do not meet the requirements for the new types of batteries.

For batteries, it is particularly important that there are no impurities in the nickel or manganese used.

In addition to the raw materials required for the battery itself, however, one should not forget the additional demand for raw materials for the necessary infrastructure, the electric cars themselves and the raw materials required for the production of renewable energy for solar and wind. Here we see a significant increase in demand in the coming years, especially for copper (infrastructure), silver (e-cars and solar) and rare earths (magnets for wind power). Analogous to lithium in the past years, we do not see any investments in the three metals mentioned to be prepared for the upcoming increase in demand.

Tobias Tretter

As Managing Partner, Tobias Tretter has led Commodity Capital AG since its foundation in 2009 and supports it with his many years of experience and expertise in the commodities sector as Portfolio Manager and Chief Investment Officer (CIO).
He is responsible for the investment advice for the Commodity Capital Global Mining Fund and establishes the basis for the long-term success of Commodity Capital AG with his analyses on mining companies.
Tobias Tretter obtained his predicate degree at the University of Bayreuth, where he wrote his diploma thesis on a practical basis on the life cycle analysis of commodity companies. This study as well as various further education such as the DITA (diploma of international technical analysis) form the theoretical background and thus the basis for his daily work.
Tobias Tretter started his career at Credit Suisse Asset Management and applied his practical experience in advising and supporting the DJE Gold und Ressourcen Fonds of the Dr. Jens Ehrhard Group. The result was the award as "best gold fund 2003" as well as a self-employment in the consulting of commodity funds. Together with the fund management of Stabilitas Fonds he again achieved the award as "best gold fund 2006".



Lithium hydroxide is needed for battery production
(Source: Xinle City Hongyuan)

Where do you see opportunities to increase lithium production in the coming years and what difficulties do you see?

Lithium production has increased in recent years primarily due to higher production of lithium concentrate from Australia and it is no surprise to us that Australia has replaced Chile as the world's largest lithium producer. We see very limited potential to significantly increase production in South America in general. Lithium production from brine, i.e. from dried up salt lakes in South America, is on the one hand limited by the water flowing into the salt lakes from the mountains and on the other hand almost all relevant salt lakes that can be exploited with conventional mining methods are already in production or in the development phase. It was therefore not surprising that a takeover battle for Millennial Lithium broke out this year and with Neo Lithium the second already advanced developer was taken over. Future potential is likely to focus primarily on Australia and North America. And here we come to the current dilemma. Although Australia has additional lithium reserves, so far only lithium concentrate is mined in Australia and this is then shipped to China where it is converted into lithium carbonate or lithium hydroxide, which is needed for battery production. This bottleneck represents a gigantic challenge, especially in view of the tensions between China and Australia. And we can well imagine restrictions or tariffs on unprocessed lithium from Australia in the coming months and years. Similar to South America, voices are becoming louder in Australia that see it as problematic to ship the valuable raw material lithium cheaply to China in order to have most of the value added there afterwards. Against this background, there is a bigger question mark behind the expansion of lithium production, and we expect that the expansion of Australian lithium production will fall short of expectations as long as Australia does not succeed in building up its own refinery capacities. And here we come directly to the crucial point for North America, which in itself has the greatest potential to fill the supply gap. However, there is no refining capacity in North America either and it is therefore extremely difficult and capital intensive to bring new projects into production. However, we do see new refining capacity being built in the coming years – whether by independent companies looking to make a profit, by the US government looking to build a strategic reserve, or by one of the automakers (Tesla?) themselves. The drive for independence from China is more pronounced in North America than in Europe and we already see refining capacity being built in North America in the medium term. This will lead to a re-evaluation of all North American projects, and we currently see the greatest opportunities for the development of additional lithium production in North America.

commoditycapital
invest in real assets

What do you look for in a battery metal mining company or resource?

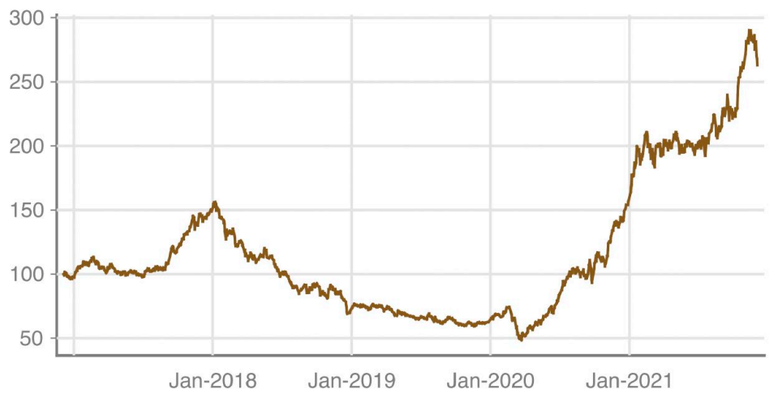
The most important criterion in our investments is the management of the company. Apart from the fact that too little investment has been made in the battery metals sector in recent years, the main problem is not to find a good project, but to find an experienced management that can successfully bring the project into production. In addition, ESG criteria play a decisive role for us and are one of the reasons why we regularly visit our investments and seek contact with the local population. After all, who can give you better information than the local people who either work on the project every day or know someone who does? In addition to management, we also try to minimize political risk and concentrate our investments in North America and Australia. Especially in the lithium sector you can't avoid investments in Argentina and Chile, but here we try to keep the risks manageable and carry out a particularly intensive due diligence.

In addition to the points mentioned, we are also trying to invest in companies that can go into production under their own steam in the next 5 years and thus benefit directly from the positive upswing in the coming years.

You are the manager of the Structured Solutions Next Generation Resources Fund. Which battery metals or stocks does this fund cover?

We established the fund in 2009 to give investors an opportunity to profit from the transition to electromobility. First and foremost, over 60% of the portfolio consists of lithium companies. We see no substitute for lithium in the coming generations of lithium batteries and believe that this is where the growth potential is greatest. We also selectively invest in companies involved in the mining or exploration of copper, manganese, rare earths and silver.
We have positioned the fund to benefit in the best possible way from the growing demand for electric vehicles, and we continue to try to focus not only on the performance of battery metals, but also on identifying the best companies within the sector.

Performance of the Next Generation Resources Fund



Performance of the Next Generation Resources Fund over the last 5 years in EUR
(Source: commoditycapital)

Alpha Lithium

In the best lithium hot spot worldwide with a unique processing method

Brad Nichol, CEO

Alpha Lithium is a Canadian mining development company that specializes in the discovery and development of high-grade lithium projects. Alpha Lithium has found what it is looking for in the South American lithium triangle, an area with a large number of high-calibre lithium deposits on the border of the three countries Argentina, Chile and Bolivia. There the company is developing two projects surrounded by several major lithium mines. By means of a unique processing method, lithium in high concentrations should soon be extracted from the ground there.

Tolillar Salar – Location and infrastructure

Alpha Lithium‘s flagship project is called Tolillar and is located in the eponymous Tolillar Salar salt lake. The acquisition was made in March 2020, essentially through the acquisition of a private Canadian company through the issuance of treasury shares. The project comprises 10 concessions covering a total area of 27,500 hectares. Tolillar Salar is thus located in the well-known lithium triangle of Argentina, Bolivia and Chile and within the Puna geological region in northwestern Argentina. Tolillar Salar is surrounded by multi-billion-dollar lithium assets.

Tolillar Salar is located approximately 3 hours by car from San Antonio de los Cobres (presence of all major services including fuel and medical supplies) and 6 hours by car from the provincial capital of Salta. The project site is served by a well-maintained paved and unpaved road network, as well as a gravel and dirt road that runs within 10 kilometers of the project. The nearest rail line in the region is an existing narrow-gauge railroad between Salta, Argentina and the Pacific Coast port of Antofagasta, Chile. A 600-megawatt, 375-kilovolt power line between Salta and Mejillones, Chile runs approximately 150 kilometers north of the property. A natural gas pipeline runs less than 10 kilometres east of the project area.

Tolillar Salar – Historical Exploration Activities

Since 2012, several explorations have taken place on the project site, including surface brine sampling campaigns, trench brine sampling, shallow borehole sampling, and a Vertical Electrical Sounding (VES) survey. Exploration and drill samples were collected from shallow trenches and shallow boreholes in 2018. This included pumped samples during drilling. Laboratory results from the pumping tests showed, among other things, that the subsurface brine in the northern portion of the permit area also has enriched lithium concentrations. Overall, lithium concentrations of up to 504 mg/L were detected in well samples. The ratio of magnesium to lithium at Tolillar Solar appears to be very low, which is favorable for traditional processing. Initial results for lithium & potassium concentrations from surface samples support a very favourable production scenario, especially as solar radiation is very intense, particularly during the summer months of October to March, resulting in extremely high evaporation rates. Despite the aforementioned exploration activities, much of the concession area has never been extensively explored using modern exploration methods.

Tolillar Solar – Own exploration activities and resource estimate

In November 2020, the Company announced that a VES survey suggests that the brine body prevalent in the northern part of the salar extends far to the south and also supports the concept that the basin in the Tolillar Salar is similar to the adjacent prolific Hombre Muerto Salar. Similar to Hombre Muerto and other nearby lithium-rich salar basins in the region, Tertiary sedimentary rocks form the basin-bounding rocks to the west of Tolillar Salar and likely resulted in similar basin-filling conditions. The potentially favorable aquifer target identified in the VES study extends beyond the southernmost extent of the surveyed area and appears to extend deeper than what the instruments could measure, yielding a thickness of at least 170 meters. In addition, the VES results showed that the brine body, identified as penetrative in the initial geophysical survey, extends a further 10 square kilometres into the southern part of Tolillar Salar. It is measured to be between 73 metres and at least 267 metres thick and extends deeper than what the VES equipment was able to measure.

Based on these findings, Alpha Lithium initiated a three-phase drilling campaign in December 2020, the purpose of which is to collect lithium brine samples from depth and use them to begin evaluating the Direct Lithium Extraction (DLE) process that the Company intends to deploy. By the end of April 2021, the first two phases of the drilling campaign could be completed with a total of 4 production holes. Based on promising historical data in the Tolillar Salar, Alpha Lithium decided to drill all holes as production holes rather than core holes. Core drilling, while faster to drill, does not result in pumpable wells where traditional aquifer testing can be conducted to obtain hydraulic parameters. Core samples provide lithological data that can take months to analyze, with the goal being simply to improve knowledge of reservoir properties, such as drainable porosity. Production wells are immediately ready for production, can be logged to determine effective porosity and permeability, and can be flow tested to determine brine pumpability parameters and the chemistry of the composite brine ultimately required for lithium processing.

The Phase 3 drilling currently underway is expected to advance to a depth of at least 450 metres, far deeper than any previous drilling. The objective is to prepare and publish a maiden proprietary resource estimate for Tolillar Salar upon completion of the entire drilling campaign.

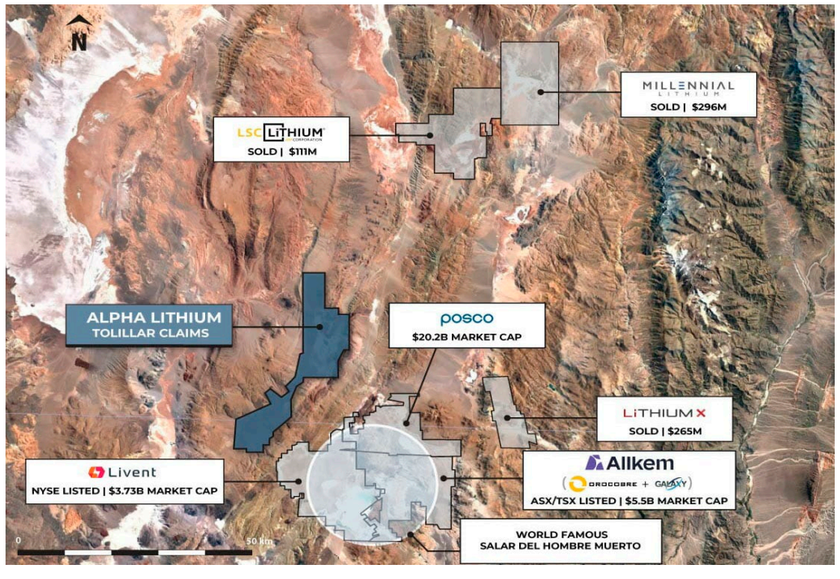
Intended DLE process offers many advantages

In November 2020, Alpha Lithium announced that it had signed an agreement with Beyond Lithium SA to provide in-house expertise relating to brine processing and direct lithium extraction (DLE). Beyond Lithium consists of an internationally recognized team of chemical process engineers with decades of experience advising and managing global leaders in the lithium sector. Beyond Lithium‘s directors have previously worked extensively on high profile projects including SQM‘s Atacama Project in Chile, Orocobre‘s Salar de Olaroz Project and Lithium America‘s Salar de Cauchari Project.

Alpha‘s initial DLE assay returned a lithium concentration of 4,540 mg/L using raw brine from the historic Legacy well drilled by the previous owners in the Tolillar Salar. The 4,540 mg/L result was achieved using a single pass reverse osmosis process. Later in the year, Alpha Lithium was able to increase the lithium concentration to nearly 9,500 mg/L, which was achieved through secondary ion exchange and reverse osmosis. This is the result of multiple brine samples taken from various depths in the well. The combination of high lithium concentration and exceptionally low impurity levels is critical for the subsequent process steps. Later in the year, after weeks of testing raw brine samples from the Tolillar Salar, the Company was able to produce the expected quantities of lithium hydroxide and lithium carbonate on a laboratory scale.

Lilac Solutions to bring further improvements

In parallel, Lilac Solutions Inc was engaged in April 2021 to undertake further technical work on direct lithium extraction on brine samples from Alpha Lithium‘s Tolillar Salar. Lilac‘s technical work is intended to complement Alpha Lithium‘s internal technical work being carried out by Beyond Lithium SA.



Alpha Lithium is surrounded by big players and recently acquired projects. (Source: Alpha Lithium)

Accordingly, Lilac was contracted to begin Stage 1 engineering. For this, 2,000 litres of brine samples were sent directly from the Tolillar Salar to Lilac's offices in Oakland, California. The brine was passed through Lilac's proprietary lithium extraction modules. This initial test will provide the Company with information on lithium recovery rates, lithium purity evaluation, lithium chloride chemical analysis determination, as well as initial information on reagent quantities used and the preliminary range of operating costs that could be incurred in a future commercial production facility, among other things. Based on the results of Phase 1 engineering, the Company may decide to proceed with Phase 2 engineering, including refining initial OPEX numbers, establishing process design criteria and conducting lithium extraction tests for a feasibility study, and defining a customized process flow diagram for a pilot plant in the Tolillar Salar.

Entry of Uranium One

In November 2021, Alpha Lithium announced that it had entered into an asset transaction with international billion-dollar chemical conglomerate Uranium One Group. Accordingly, wholly owned subsidiary Uranium One Holding N.V. is investing US$30 million in exchange for a 15% interest in Alpha's 27,500 hectare Tolillar Salar in Argentina. Further, Uranium One holds an option to acquire an additional 35% of Tolillar for US$185 million. If the option is exercised, Alpha would retain a 50% interest in Tolillar, which would be fully funded to the point of commercial production.

Hombre Muerto

In May 2021, Alpha Lithium signed a letter of intent to acquire an unencumbered 100% interest in 3,800 hectares in Argentina's Salar Hombre Muerto, widely considered to be one of the highest-grade producing lithium brine salars in the world, comparable only to the Salar de Atacama in Chile. In June and August 2021, the Company expanded this project by an additional 1,272 hectares through two deals. Alpha Lithium will be surrounded by key players at Hombre Muerto, which is known for its high-quality brine with record-high lithium concentrations and exceptionally low impurities. It hosts Livent Corp's Fenix operation, which has been in commercial production for over 25 years. Hombre Muerto is also home to the Sal de Oro project of Korean giant POSCO, which it acquired from Galaxy Resources Limited for US$280 million. In addition, the southern part of Hombre Muerto is home to Galaxy, which recently announced an AU$4 billion merger with Orocobre Limited. A small VES survey was carried out on the property which confirmed the presence of the known underlying productive zones of the Hombre Muerto Salar. The Company plans to commence drilling in the area immediately.

Summary: Something big is growing up!

Alpha Lithium was able to achieve more in only one year than many lithium explorers in 10 years. Right from the start, the company stepped on the gas and, in addition to exploration, evaluated the possibility of processing using a modern, environmentally friendly DLE process. The management around CEO Brad Nichol and Country Manager David Guerrero, who knows the area very well and has already had success in the Hombre Muerto Salar, must be incredibly sure with the resource base that has not yet been determined, if they are going to drill production wells right away. Just as confident as a dozen or so high-profile lithium investors who helped Alpha Lithium fund a whopping CA$23 million in fresh capital in February 2021 instead of the CA$10 million originally planned. A leap of faith, which the management should repay shortly with top results.

Exclusive interview with Brad Nichol, CEO of Alpha Lithium

What have you and your company achieved in the past 12 months?

In the last year, the Company has achieved three major milestones. The first, is that we have attracted significant, global, institutional investors and built the treasury to over $30 million. Over the last 12 months, the Company has seen a total of 185 million shares traded amongst our investors, with an average trading volume of 730,000 shares per day. The second milestone is that we initiated and have almost completed a complete hydro-geologically based exploration and drilling program, which covers approximately 70% of the 27,500 hectares of Tolillar Salar. This initial, extensive, exploration program defined the reservoir parameters and broad geological definition of the Tolillar Salar, in addition to providing the foundation for our next stage of resource definition. The third major milestone, which is the one I'm most excited about, is that we have slowly and quietly acquired a large land position in the neighboring Hombre Muerto Salar – alongside multi-billion-dollar giants like POSCO, Livent and Galaxy/Orocobre. The quality of this salar is literally world-class. We have acquired an enviable 5,000 hectares so far and we are not stopping here. Hombre Muerto will be the next sandbox in which we build a very serious castle!

What are the most important company catalysts for the next 6 to 12 months?

Like our previous achievements above, good things come in threes. The first catalyst I hope to see soon is a resource estimate and, ideally, a major chemical processing partner in Tolillar Salar. This would see us build-out the on-salar infrastructure, such as additional wells, seismic, roads, an expanded camp and – most importantly – a pilot plant to demonstrate small-scale viability of lithium carbonate

and/or lithium hydroxide production. The second catalyst would be the initialization of a drilling campaign on our properties in Hombre Muerto. We already know that Hombre Muerto houses some of the highest lithium concentrations in the world and the level of impurities are very low; thus, starting from such a pure position, we would expect to eventually produce some of the world's highest quality, battery grade lithium. The third catalyst I hope for is to add some even bigger pieces to our Hombre Muerto position. When you're in the world's best neighborhood already, it seems only logical to continue adding to your already-strong position.

How do you see the current situation on the market for battery metals?

I really like this question because I live and breathe Argentine lithium and I might sometimes forget that our shareholders might not know what I know and see what I get to see. Argentina today – and the global lithium market in general – is experiencing complete madness. For the last few weeks, we have witnessed a seemingly desperate rush on behalf of lithium users/purchasers/processors to acquire resources. Millennial Lithium (just north of us) and Neo Lithium (just south of us) are the two most recent examples of industry looking to acquire the underlying lithium resources and secure their supply source for the future. Our operations in Tolillar and Hombre Muerto Salars are early stage; however, they are large, unencumbered positions in or near the world's most famous and highly-sought-after salars. This is a great time to be a well-capitalized, production-focused junior with 100% ownership of enviable lithium assets. Even better – in my opinion, it is a great time to be a shareholder of such a junior company!

ISIN: CA02075W1059
WKN: A2PNLY
FRA: 2P62
TSX-V: ALLI

Shares outstanding: 114.4 million
Options: 10.0 million
Warrants: 44.2 million
Fully diluted: 168.6 million

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Alpha Lithium Corp

Canada Nickel

Huge nickel deposit with robust PEA in Canada


Mark Selby, CEO

Canada Nickel is a Canadian mining development company specializing in the battery metal nickel. The company was listed on the stock exchange at the end of February 2020. Canada Nickel owns 100% of the Crawford nickel-cobalt sulphide project, which hosts one of the world's largest nickel deposits in an established mining camp and is adjacent to existing infrastructure north of Timmins, Ontario, Canada. A preliminary economic assessment recently showed robust numbers. The Company is working hard to establish a new nickel district and net zero CO_2 footprint.

Crawford flagship project – location and infrastructure

The approximately 2,300-hectare Crawford Nickel-Cobalt Core Project is located approximately 35 kilometres north of the mining town of Timmins, within the Timmins Mining Camp of the same name, which has a history of over one hundred years as a mining district. Highway 655 runs directly through the project site, as does a 550 kV power line. The Lower Sturgeon Falls hydroelectric power station is only three kilometres away. Glencore's Kidd Creek mine and mill, including train service, is only about 10 kilometres away, and the Hoyle smelter/refinery is about 40 kilometres by road and 25 kilometres by rail from Kidd Creek. Timmins itself has sufficient experienced mining personnel.

Crawford Project – Limited Historical Exploration Activities

The Crawford project has only recently come into the focus of modern exploration. Inco drilled several holes in the 1960s, all of which indicated large nickel anomalies. Minimal exploration was carried out in the 1970s and 1980s. By 2011, the entire area was owned by forestry companies, so no exploration took place for several decades and the project was almost forgotten. In addition, no nickel outcrops were found on the property. In 2011, Noble Mineral Exploration Inc. finally acquired the project. Mineralization at Crawford is contained within a serpentinized ultramafic area that has a distinct geophysical signature.

Crawford Project – Resource

In October 2020, Canada Nickel released a new resource estimate based on the Canadian NI43-101 resource calculation standard. This revealed that Crawford hosts a higher-grade core resource of approximately 280.2 million tonnes of measured and indicated resources of 0.31% nickel, 0.013% cobalt and 0.040 g/t palladium + platinum within a total measured and indicated resource of approximately 653 million tonnes of 0.26% nickel and 0.013% cobalt. In addition, a higher grade inferred resource of approximately 109.9 million tonnes of 0.29% nickel and 0.013% cobalt within a total inferred resource of approximately 497 million tonnes of 0.24% nickel and 0.013% cobalt. This makes the Crawford resource one of the 12 largest nickel deposits in the world!

Crawford Project – Preliminary Economic Assessment

In May 2021, Canada Nickel released a preliminary economic assessment (PEA) for Crawford. This showed robust economics, supported by an after-tax NPV of US$1.2 billion and an after-tax rate of return (IRR) of 16%. Crawford could yield an annual average nickel production of 75 million pounds (34,000 tonnes) over a mine life of 25 years. It would also produce significant iron and chrome by-products of 860,000 tonnes per year and 59,000 tonnes per year, respectively. In total, production over the mine life would be approximately 842,000 tonnes of nickel, 21 million tonnes of iron and 1.5 million tonnes of chromium with a combined value of US$24 billion. Net all-in sustaining costs were estimated at US$1.94 per pound of nickel, including by-products. Crawford would have annual EBITDA of

US$439 million and free cash flow of US$274 million. The use of autonomous trolley trucks and electric shovels would reduce diesel consumption by 40%, contributing significantly to the achievement of a net zero CO_2 footprint.

With this PEA, the Company has been able to confirm the economic viability of Crawford, notwithstanding the fact that it arguably has far greater potential.

Crawford Project – Exploration Potential

This is because although the Crawford resource already appears huge, only a fraction of the total strike length has been explored to date. The higher-grade core area has been defined over a length of 2.6 km with a width of 150-220 metres and to a depth of about 650 metres. There is still enormous potential, particularly at depth. For example, one hole was drilled to a vertical depth of 850 metres. The assayed sample averaged 0.31% nickel, 0.013% cobalt, 0.022g/t palladium and 0.008g/t platinum over 901 metres. Continuous drilling has been conducted throughout 2020 and 2021 and has produced some spectacular results. For example, 27 metres at 0.40% nickel plus cobalt, palladium and platinum. In addition, a new zone called the East Zone was discovered in May 2020. There 256 metres with 0.30% nickel and 0.05g/t palladium + platinum were proven. In addition, a higher-grade core was also discovered there in 2021, which yielded 576 metres of 0.31% nickel, among others. In October 2020, Canada Nickel announced the discovery of a third zone called the West Zone. The company initially drilled 4 holes and found 30 meters of 0.29% nickel and 0.014% cobalt ending in mineralization. Finally, in December, they were able to discover a fourth, the North Zone. This covers approximately 1,100 metres by 400 metres.

Metallurgical test results published in October 2021 confirmed very good recoveries of 62% for nickel, 45% for iron and 70% for cobalt.

Crawford Project – Platinum-Palladium Discovery

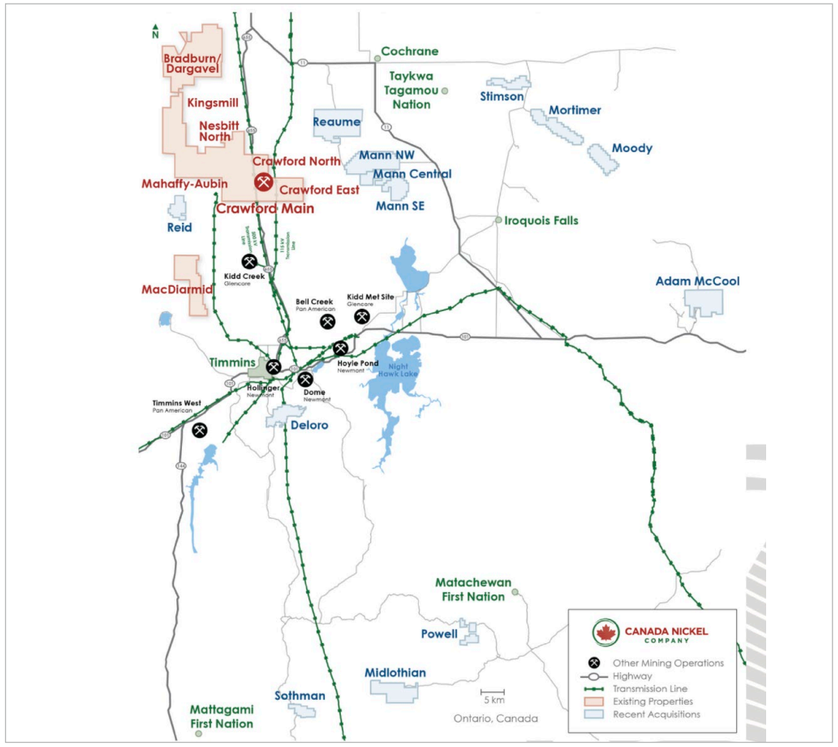
In March 2020, Canada Nickel announced the discovery of a new palladium-platinum zone discovered through drilling. Multiple drill holes intersected this zone, starting at the bedrock contact and extending to a depth of 500 metres over a strike length of 600 metres. The separate PGM zone returned grades of up to 2.6 g/t palladium + platinum over 7.5 metres. With palladium prices in excess of CA$1,800 per ounce and few new palladium discoveries worldwide, the discovery of this new multi-gram, near-surface palladium-platinum zone, which parallels Crawford's existing nickel-cobalt-palladium resource, underscores Crawford's significant potential and provides additional options in the development of the project.

Crawford project – Glencore deal

In January 2020, Canada Nickel announced a sensational deal with Glencore that should greatly improve the economics of the Crawford project. This allowed for the signing of a non-binding letter of intent for the potential use of Glencore's Kidd concentrator and metallurgical site in Timmins, Ontario, for the treatment and processing of material from Crawford. Crawford is located 40 kilometres north of Glencore's operations. The facility has a rated capacity of 12,500 tonnes per day and has a full water intake and discharge permit and a thickened tailings storage facility. The site has inbound and outbound rail access via the Ontario Northland Railway.

Massive expansion of the Crawford project and other bull's-eyes

In March 2020 and April 2021, Canada Nickel announced that it had entered into an agreement with Noble Mineral Resources to expand the Crawford Project whereby Canada Nickel acquired 100% of the previous option areas, Crawford-Nesbitt-Aubin, Nesbitt

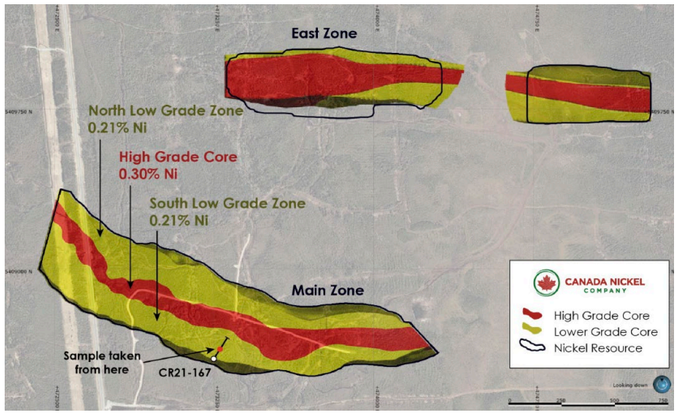


Canada Nickel recently secured additional project areas (blue) in addition to its high-profile projects (red), which it hopes will yield similar nickel deposits. (Source: Canada Nickel)

North, Aubin-Mahaffy, Kingsmill-Aubin and MacDiarmid and Bradburn-Dargravel. This followed Canada Nickel identifying a total of 7 nickel-bearing structures on the new concessions as early as mid-2020, extending over a strike length of approximately 30 kilometres with widths ranging from 150 to 600 metres. Airborne geophysical surveys were conducted in October 2020. This resulted in the identification of a 1,800 metre by 400 metre exploration target at MacDiarmid which is 15% larger than the Crawford Main Zone. The first three holes drilled at MacDiarmid returned significant intercepts of mineralized dunite in 2021, similar to the average mineralization originally discovered by the Company at Crawford. The first two discovery holes on the Nesbitt nickel property intersected visible nickel sulphides in a geophysical target that is 3.7 kilometres long and 100 to 400 metres wide. The first two holes on the Mahaffy Nickel Property and the first two holes on the Kingsmill Property intersected mineralized dunite over a core length of up to 417 Meters. In November 2021, Canada Nickel acquired an additional 13 exploration projects around Timmins.

Emergence of NetZero Metals

In July 2020, a wholly owned subsidiary, NetZero Metals, was formed to commence research and development of a processing facility in the Timmins region to leverage existing technology to produce carbon-free nickel, cobalt and iron products. The Company has applied for trademarks for the terms NetZero NickelTM, NetZero CobaltTM and NetZero IronTM in the United States, Canada and other jurisdictions in connection with the carbon-free production of nickel, cobalt and iron



Canada Nickel continues to demonstrate significant metallurgical performance improvements at Crawford Nickel Sulfide Project
(Source: Canada Nickel)

products. Canada Nickel will explore the potential for producing nickel and cobalt products from existing pyrometallurgical processes such as roasting, sulphation and reduction using electric arc furnaces (which use natural gas as a reductant instead of coke or coal), with off-gases captured and vented to capture the carbon generated CO_2 by the waste rock and residue from the Crawford Nickel Cobalt Sulphide Project.

Summary: New resource estimate and feasibility study in progress

Canada Nickel owns 100% of the Crawford nickel-cobalt sulphide project, a brand-new nickel discovery with huge potential in an established mining camp, one of the best infrastructures in Canada. Crawford continues to have significant expansion potential as only a fraction of the existing anomalies have been tested to date, as recent discoveries have clearly demonstrated. The newly acquired regional exploration targets are also exciting as they share the same geophysical signatures that led to the Crawford discovery. Given Crawford‘s proven track record, this provides much larger areas for full development of Crawford and additional exploration targets that could potentially host similar nickel-cobalt deposits to Crawford. It is interesting in this context that MacDiarmid may have been discovered as a sort of second Crawford. Furthermore, the Glencore deal should have a strong impact on the project‘s economics, as it should eliminate high capital costs. A new resource estimate has been announced for early 2022, with a feasibility study to be released by mid-2022. With a $12 million financing in mid-2021, Canada Nickel is currently sufficiently financed.

Exclusive interview with Mark Selby, CEO of Canada Nickel

What have you and your company achieved in the past 12 months?

Canada Nickel has rapidly advanced its 100% owned Crawford Nickel-Sulphide Project, which is located in the world-class Timmins-Cochrane mining camp.

The Preliminary Economic Assessment (PEA), which confirmed robust economics showing an after-tax NPV 8% of US$1.2 billion and an after-tax IRR of 16% was completed in May 2021 and also demonstrated that Crawford has the potential to be one of the five largest nickel-sulphide operations. The company then immediately begun its Feasibility Study expected to be completed in 2022, just three years after drilling commenced.

The Company has a number of substantial upsides for the feasibility. The company is targeting a 50-100% increase in the resource utilized in the feasibility study and recently announced results from successful infill drilling from the East Zone which also uncovered a High-Grade Core running along the majority of the 2.1 km strike of the deposit.

A 4-5 percentage point improvement in nickel recovery is also targeted as the PEA was completed with less than one year of metallurgy work. The initial results were recently announced and indicated a 6-16 percentage point improvement recovery in the 4 samples that were tested and additional improvement in Co, Fe recovery and Fe concentrate grades.

What are the most important company catalysts for the next 6 to 12 months?

The most significant catalysts will be the completion of a Feasibility Study by the end of 2022, and a resource update which will be utilized in the feasibility study by mid-2022 with a target of 50-100% increase in the existing resource.

The Company is advancing on a large number of different fronts: selecting a strategic investor by the end of 2021, quantifying the potential for the Company’s tailings and waste rock to spontaneously absorb CO_2 to allow Net-Zero carbon production of nickel, cobalt, and iron; advancing MOUs with the local First Nations to definitive agreements, and initiating the permitting process for the project.

How do you see the current situation on the market for battery metals?

Once again, nickel demand growth continues to be underestimated by most analysts – nickel demand is up 15%+ this year (3-5X other base metals) driven by a combination of demand from the EV sector growing by more than 100% and demand from stainless steel growing by more than 10%. This demand growth is leading to the largest nickel market deficit ever in 2021 – contrary to most analysts who forecast the market at the start of the year to be in a 3-5% surplus and consistent with the Company’s view of the emergence of a nickel super cycle by the middle of this decade.

Canada Nickel Company

ISIN: CA13515Q1037
WKN: A2P0XC
FRA: 4E0
TSX-V: CNC

Shares outstanding: 91.8 million
Options/RSUs: 8.2 million
Warrants: 0.2 million
Fully diluted: 100.3 million

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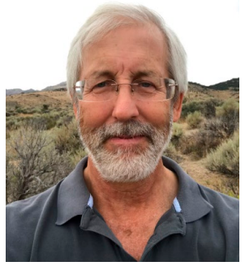
Cypress Development

High-Calibre and Advanced Lithium Project with Top Prefeasibility Study in Nevada



William Willoughby, CEO:

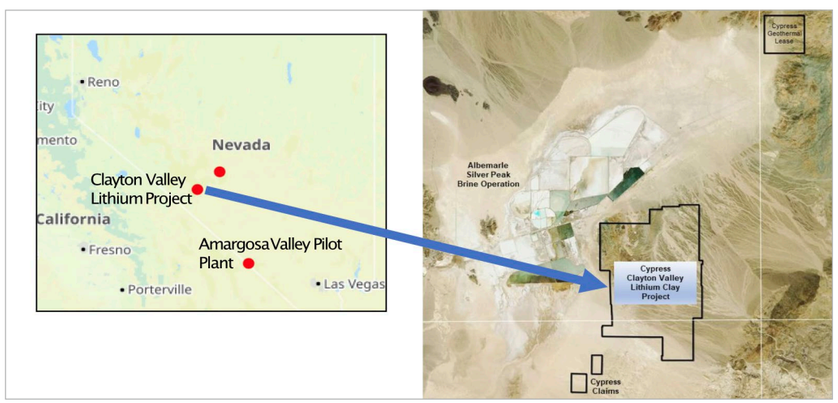
Cypress Development is a Canadian mining development company specializing in the base and battery metal lithium. The company is focused on the development of its 100% owned Clayton Valley Lithium Project in Nevada, USA. Cypress Development has already announced a high-profile discovery of a world-class lithium-rich mudstone resource near Albemarle's Silver Peak Mine, North America's only lithium brine operation, at its project site, which is also adjacent to several other advanced lithium projects. A 2021 enhanced pre-feasibility study certified excellent economics for the project. The company is currently working on optimizing the processing with the help of its own pilot plant.

Clayton Valley Lithium Project – Location and Infrastructure

The Clayton Valley Lithium Project is located in the Clayton Valley of the same name, in the southeast of the US state of Nevada, east of Albemarle's Silver Peak lithium mine, which has been in operation since 1966. Cypress Development's project encompasses approximately 6,558 acres and is situated amidst very well-developed infrastructure. Several state highways connect Silver Peak to the main road network in Nevada. Gravel roads connect Silver Peak to the southern half of Clayton Valley. Connection to the electric grid is available at the substation in Silver Peak. Water is currently supplied by Silver Peak's municipal water supply, although Cypress Development is already in the process of securing extensive water rights. Nevada itself is considered the best mining region in the U.S. and is ranked third in the world by the prestigious Fraser Institute's annual Survey of Mining Countries.

Clayton Valley Lithium Project – Exploration, Geology and Resource

Cypress Development acquired the initial project claims in 2016 and conducted extensive drilling campaigns and metallurgical testing over the next three years. The Company's exploration and development work quickly led to the discovery of a world-class resource of lithium-bearing mudstone near the brine field east and south of Angel Island, an outcrop of Paleozoic carbonates that outcrop from lake-bottom sediments. Lithium mineralization occurs within the montmorillonite clays in the sediments to a depth of at least 150 metres. Metallurgical tests have shown that low-cost processing is possible by leaching with low acid consumption and high lithium recovery of over 85% Li. These high extractions prove that the predominant lithium-bearing minerals are not hectorite, a refractory clay mineral that requires roasting and/or high acid consumption to release the lithium. The flat lying deposit allows mining with a low overburden ratio. Open pit mining does not require drilling or blasting during excavation. Currently, Clayton Valley has a resource of 1,304 million tonnes of rock averaging 905 ppm lithium (6.28 million tonnes LCE - lithium carbonate equivalent) based on a cut-off grade of 400 ppm lithium. Reserves are 213 million tonnes averaging 1,129 ppm lithium (1.28 million tonnes LCE).



Cypress Development's Clayton Valley project is immediately adjacent to Albemarle's high-grade Silver Peak lithium mine.
(Source: Cypress Development)

Clayton Valley Lithium Project – Positive PEA and Pre-Feasibility Studies

A Preliminary Economic Assessment (PEA) was already prepared in 2018, which certified positive economic viability.

Cypress Development then commissioned the preparation of a pre-feasibility study, which was published in August 2020 and optimized again in a modified form by March 2021. This showed very good economic viability, even for a moderate base case lithium carbonate price of only US$9,500 per tonne. Based on an average production rate of 15,000 tonnes per day, the pre-feasibility study calculated an annual production of 27,400 tonnes of lithium carbonate equivalent over a 40-year mine life. The estimated capital cost of this is US$493 million, with estimated pre-production and operating costs averaging US$3,387 per tonne of LCE. An after-tax NPV-8% of US$1.03 billion and an after-tax IRR of 25.8% have also been calculated. For a 50% higher lithium carbonate price of US$14,250, the NPV would be US$2.142 billion, and the IRR would be 41.3%.

A further bankable feasibility study is currently underway and is expected to be published in 2022.

Clayton Valley Lithium Project – Metallurgical Studies

The lithium in the deposit is associated with illite and smectite clays and can be leached with dilute sulfuric acid, followed by filtration, solution purification, concentration and electrolysis to recover high purity lithium. Extensive metallurgical work determined optimal conditions for leaching, including time, acid concentration and temperature. Testing showed that there was little difference in sample depth, oxidation or weathering state of the clays. Extensive leaching tests were performed on samples to obtain slurries for rheology, filtration and lithium recovery tests. The tests gave average results of 86.5% recovery of lithium at only 126.5 kg/tonne acid consumption. Tests were conducted to identify a commercial means of solid-liquid separation, with specific conditions and equipment identified. Solids from filtration tests simulating the final circuit were generated. The solids after single stage washing are suitable for transport by conveyor belt to a conventional dry tailings storage facility. NORAM Engineering & Constructors Ltd and CMS designed and tested the flowsheet for the recovery of the lithium from solution. A very successful test programme which delivered a purified, concentrated lithium solution suitable for the production of high purity lithium hydroxide (LiOH).

Clayton Valley Lithium Project – Pilot Plant

With the knowledge gained from extensive metallurgical testing, Cypress Development was able to design its own pilot plant. This utilizes an existing metallurgical facility near Beatty, Nevada. The plant could be commissioned in November 2021. This will operate at a rate of 1 tonne per day and is designed to properly interact and test the major components within the extraction process and evaluate the resulting lithium products. Operation of the pilot plant will provide essential

data for the planned feasibility study and will also enable Cypress to produce marketing samples to support negotiations with potential customers and strategic partners. The goal is to demonstrate the production of lithium hydroxide on a larger scale. Results from the various areas of the plant, from leaching and tailings handling to solution processing and recycling, chemical consumption and water balance, will provide the data necessary to advance the project to feasibility.

Clayton Valley Lithium Project – Water Rights

In May 2021, Cypress Development announced that it had entered into a letter of intent to acquire water rights. In early November 2021, the Nevada Division of Water Resources approved a term extension to the seller Nevada Sunrise Gold Corp for its Nevada Water Right Permit 44411, which was a key condition of the water rights purchase. The permit allows the use of 1,770 acre/feet of water per year for mining, milling and other uses and is an important milestone towards meeting the water supply requirements and development of the Clayton Valley Lithium Project.

Strong management team

Cypress Development has a very experienced and strong management team.

President, CEO and Director Dr. William Willoughby is a mining engineer with 38 years of experience in all aspects of natural resource development. Since 2014, he has been principal and owner of the consulting firm Willoughby & Associates, PLLC. Prior to that, he was President and COO of International Enexco Ltd, which was acquired by Denison Mines in 2014. Prior to that, he held various positions at Teck Cominco.

CFO Abraham Jonker is a seasoned financial executive with nearly 30 years of experience in the mining industry. Jonker has played an instrumental role in several corporate reorganizations and restructurings, has been a key management and board level team member in the strategic growth of a number of publicly traded companies, and has participated in or overseen the raising of more than $750 million in equity and debt instruments in the mining industry.

Project Manager Adam Knight is a professional mining engineer who has worked in the mining industry since 1994. Prior to joining Cypress, he worked as a consultant and project manager for Practical Mining LLC in Elko, Nevada. Until 2015, he was vice president operations at EMC Metals Corp. Prior to that, Knight served in various operational roles for Teranga Gold, Premier Magnesia and AngloGold. He has experience in both surface and underground mining.

Summary: The first interested parties should not be long in coming

Cypress Development has a very advanced lithium project in one of the best mining jurisdictions in the world. The company is already in the definitive feasibility phase. A bankable feasibility study is in the pipeline for next year, and a pilot plant is already underway, which should further de-risk the project. The project has the potential to recover other by-products besides lithium, including rare earths, primarily scandium, neodymium and dysprosium, which have been identified in solution, as well as alkali salts. However, these have not yet been included in the prefeasibility study, which offers further upside potential. In addition, the company is in the process of securing incredibly important water rights. Taken together, this is a top development that Cypress Development has to show and will still accomplish in the coming months. This is also the view of investors, who provided the company with fresh capital in March (well oversubscribed financing of CA$19.5 million) and November 2021 (CA$6.9 million through the exercise of warrants). This described mix should soon put potential takeover bidders on the scene.

Exclusive interview with William Willoughby, CEO of Cypress Development

What have you and your company achieved in the past 12 months?

Cypress has grown appreciably over the last year, thanks to our team's success in achieving several milestones. To begin with, we had positive studies which led to our chloride leaching approach for extracting lithium from clay. In March, we closed a $20 million financing. With this financing in hand, we proceeded to purchase water rights for our project and focus efforts on our pilot plant program. We completed the design, purchasing and assembly of the plant. This included a license agreement with Chemionex for its Lionex Direct Lithium Extraction (DLE) process. Our pilot plant is now up and running and testing is underway.

Tests from the pilot plant (Source: Cypress Development)

What are the most important company catalysts for the next 6 to 12 months?

Our attention now is fully on the pilot plant. The initial work will test our design assumptions, then, depending on results, we will look for ways to improve or optimize our processing. While this is going on, there will be work on the Feasibility Study and permitting.

How do you see the current situation on the market for battery metals?

From all the market studies and the announcements, we see for new battery factories, EVs, and storage devices, we believe the present demand and future for battery metals, lithium in particular, is bullish. That said, our goal is to develop a project which is environmentally sound while being low on the cost curve. In mining, we are used to boom and bust cycles in prices. We see Cypress, however, as being well positioned to contribute to future supply.

ISIN: CA2327492005
WKN: A14L95
FRA: C1Z1
TSX-V: CYP

Shares outstanding: 127.7 m
Options: 5.8 million
Warrants: 15.9 m
Fully diluted: 149.5 million

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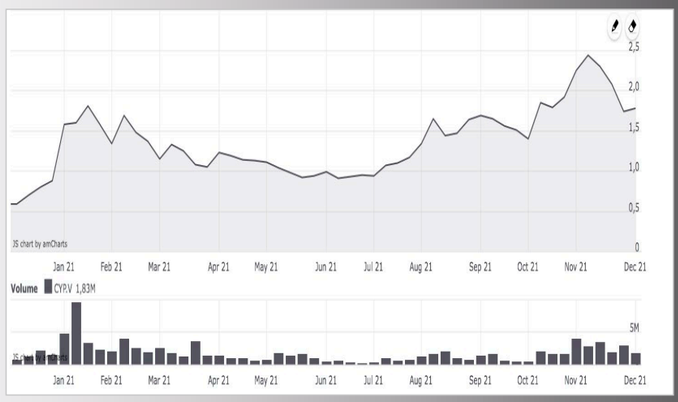


Hannan Metals

Mega-partner finances the development of one of the main projects

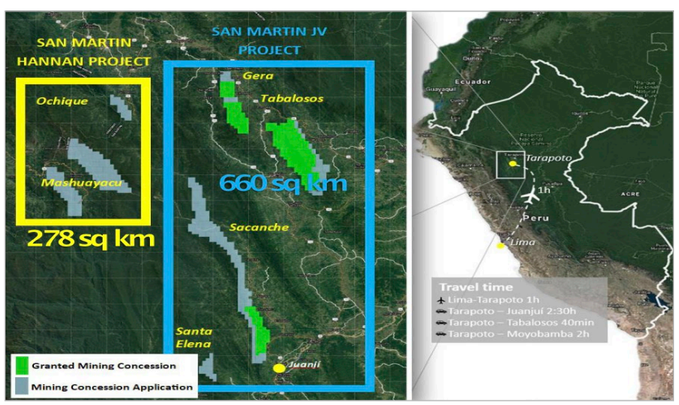
Michael Robert Hudson, CEO

Hannan Metals is a Canadian mining development company focused on discovering and developing well-located, high-grade battery and precious metals projects in secure jurisdictions. In 2018, the company recognized an opportunity to diversify its base metals portfolio and staked claims for copper in Peru. Not only do they hold one of the 10 largest land packages of any foreign mining company there, but they were also able to secure JOGMEC, a real big player in the mining industry, as a joint venture partner. The steady expansion of the land package and continuous exploration successes make Hannan Metals one of the hottest copper players in South America.

San Martin Project – Location and Infrastructure

The flagship project, named San Martin and 100% owned by Hannan, covers 1,054 square kilometres and is located 30 kilometres northwest of the city of Tarapoto. The concessions cover a total of 120 kilometres of the prospective host horizon. Hannan Metals has already received an exploration permit for 329 square kilometres. Access to the project is excellent via a nearby paved highway, while elevations range from 400 to 1,600 metres in a region of high rainfall and predominantly forest cover.

(Source: Hannan Metals)



San Martin Project – Geology

San Martin hosts a newly identified, high-grade copper-silver system that extends across the eastern Andes in Peru and adjacent countries. Geologically, this has striking similarities to sedimentary copper-silver deposits, including the giant copper shale deposits in Eastern Europe and the African Copper Belt deposits in sub-Saharan Africa, two of the largest copper areas on Earth. Hannan recognized the exceptional potential for large copper-silver deposits in this part of Peru and has aggressively staked out a dominant land position.

San Martin Project – JOGMEC Deal

In November 2020, Hannan Metals entered into a binding agreement for an option and joint venture agreement with Japan Oil, Gas and Metals National Corporation („JOGMEC"), an independent Japanese government management entity formed in 2004 by the merger of the former Japan National Oil Corporation with the former Metal Mining Agency of Japan. Under the Agreement, JOGMEC has the option to acquire up to 75% in the San Martin Project by spending up to US$35,000,000 to provide a feasibility study to the Joint Venture. This is not Hannan Metal's entire San Martin project, but approximately 656 of the 937 square kilometres of acreage.
Pursuant to the Agreement, JOGMEC is granted the option to earn an initial 51% interest by funding project expenditures of $8,000,000 over a four-year period, which may be accelerated at JOGMEC's discretion. In addition, JOGMEC has agreed to reimburse Hannan for all project related costs since April 1, 2020.
JOGMEC can then receive an additional 16% share by either conducting a pre-feasibility study or making an additional US$12,000,000 in project expenditures.
The Company will receive an additional 8% if it either conducts a feasibility study or funds an additional US$15,000,000 in project expenditures.
Should JOGMEC fail to complete a pre-feasibility study or spend a total of US$20,000,000, Hannan Metals has the option to buy back a 2% interest for as little as US$1.00, giving it back a 51% majority interest in the joint venture.
Upon completion of a feasibility study, JOGMEC has the option to receive either an additional 10% at a „fair" value or an additional 10% in exchange for JOGMEC agreeing to fund the development of the project by providing Hannan with a loan until the San Martin project generates positive cash flow.
After JOGMEC has spent US$35,000,000 and before a feasibility study has been completed, both parties will fund the expenditure on a pro rata basis or dilute through an industry standard dilution formula. In the event that either party's interest in the joint venture is diluted to less than 5%, that party's interest will automatically convert to a 2% net smelter royalty.

San Martin – Exploration Activities & First Successes

On the JOGMEC project area, Hannan Metals has already identified several potentially high-grade copper-silver zones. In July 2020, a 17,500 square kilometre regional long range geological survey was completed which identified prospective mineralized trends over a 120-kilometre strike length, as well as the identification of several new stratiform copper-silver targets.
This led to the discovery of copper-silver mineralization over a 73-kilometre strike length. There, trenching intersected 2.0 metres of 5.9% copper and 66 g/t silver, 0.6 metres of 8.7% copper and 59 g/t silver, 3.0 metres of 2.5% copper and 22 g/t silver, and 0.2 metres of 6.9% copper and 32 g/t silver, among others.
In another sub-area called Tabalosos, the combination of seismic and modern remote sensing of the surface from high resolution satellite imagery led to the discovery of 4 mineralized zones. This included trenching detecting 2.0 metres of 4.9% copper and 62 g/t silver, 1.3 metres of 3.5% copper and 86 g/t silver, 1.0 metre of 6.3% copper and 101 g/t silver, 1.8 metres of 3.7% copper and 42 g/t silver and 2.2 metres of 2.4% copper and 29 g/t silver. During 2021, Hannan Metals reported further very good results from the soil geochemical sampling program on the Tabalosos East Prospect, demonstrating copper-silver mineralization over a combined length of 24 kilometres.
Further, during the third quarter of 2021, the Company completed a large-scale LiDAR survey covering 2,782 line kilometres over 64,500 hectares of the JOGMEC JV San Martin Project. Further trenching returned 2.8 metres of 3.0% copper including 1.6 metres of 5.3% copper and 83g/t silver. A total of three completely new outcrops were discovered just under two kilometres north of the known mineralization.

Ucayali project – the second hot iron in the fire

Until Hannan Metals is required to make its own exploration expenditures on the JOGMEC Joint Venture, it has the option to focus its own resources on its other projects.
As a result, in January 2021 Hannan Metals announced the acquisition of another project area called Ucayali in Peru. The Ucayali project, comprising 906 square kilometres of mining concession applications, consists of two sub-projects, Previsto and Belen, and has been identified for 6 months through remote studies and reprocessing of government petroleum exploration data. Hannan Metals believes Previsto is highly prospective for alkaline porphyry copper-gold systems. Ingemmet, Peru's geological, mining and metallurgical institute, has a history of detecting intrusions on the project area.

Hannanmetals

Also in January 2021, Hannan Metals announced initial exploration success and a real bull's eye from Previsto. Initial reconnaissance work has identified a large-scale hydrothermal system within a 6 x 3-kilometre area on the project site that has the potential to host a porphyry copper-gold mineral system with an associated skarn. Several copper and gold mineralized float samples were taken in the process, with the best float sample returning 25.6% copper and 28 g/t silver in an interpreted supergene enrichment zone. The work carried out focused on an area extending 10 kilometres north-south and remaining open to the north, west and south. Copper and gold mineralized porphyritic intrusive rocks were also detected within flotation samples in streams, along with iron oxides, copper oxides and pyrite. Another anomalous copper and gold target has been identified in the Belen area.

Well-established management team can already point to several successes

Hannan Metals' management knows how to find and develop significant deposits.
CEO Michael Hudson has been instrumental in the discovery of advanced projects including Broken Hill (zinc, lead), in Pakistan (zinc), Peru (Accha – zinc, Bongara – zinc), Olary (copper-gold) and in Sweden (Norra Kärr – heavy rare earths). Together with President Lars Dahlenborg and Director Georgina Carnegie, he forms part of Mawson Gold's successful team that discovered, among others, the high-calibre Rompas-Rajapalot gold deposit in Finland.

Summary: Several hot irons in the fire

Basically, not much has happened at Hannan Metals yet. And yet, even in the early stages of exploration at San Martin, a mega-partner like JOGMEC is securing a foot in the door. US$35 million is not something even a major player in the industry spends just for fun. The company's own due diligence must have been correspondingly promising. While JOGMEC is financially pushing the development of San Martin on its own, Hannan Metals can use its own money for the development of the second promising project and possibly land a second top-class project. Through the exercise of warrants, the company was able to generate CA$1.7 million in fresh funds in July 2021.

Exclusive interview with Michael Robert Hudson, CEO of Hannan Metals

What have you and your company achieved in the past 12 months?

With 2,154 sq km of mineral tenure, Hannan is now a top 10 Peruvian concession holder in a country that is dominated by some of the world's largest exploration and mining companies. Hannan is one of the few juniors to acquire such a significant land position.
Our aims are to find super scale mineralizing systems in new frontier areas which will be compelling targets for the major gold and copper mining houses. Hannan is uniquely leveraged to make a significant grassroots discovery.
At the San Martin Project, which covers a new, basin-scale high-grade sediment-hosted copper-silver system situated along the foreland region of the eastern Andes Mountains, we have defined a vast basin wide copper horizon discovered over 120km averaging 2-5m @ 2-5% copper + silver and developed strong community relationship and permitting underway for drilling in Q2 2022.
At the Previsto Project we are focused on back-arc Miocene age porphyry copper-gold systems (looking for the "next" Bajo de Alumbrera) and have delineated 5-7 porphyry mineralizing systems over a 140km x 50km area. Tenure is just being granted and more detailed exploration work in next 6 months.

What are the most important company catalysts for the next 6 to 12 months?

Hannan's exploration programs are fully funded in 2021 with a Peru-wide exploration project budget of US$2.7M.
At San Martin, the focus is to continue to build a basin-scale project and complete the DIA in early 2022 to permit drilling. At Previsto, the Company is permitting more detailed work including soil sampling, mapping and trenching as well as preparing for a high resolution airborne magnetic survey in 2022.

We believe Hannan is uniquely leveraged to make significant grassroots discoveries in two prospective, yet unexplored terrains in Peru. If successful, these will be compelling targets for the major gold and copper mining houses in the years to come.

How do you see the current situation on the market for battery metals?

Amazingly bullish. Copper consumption, driven in part by the electrification of everything will double over the next 30 years. We simply have not discovered enough metal to satisfy this demand. World-class new mineralized terrains, just like Hannan have found, will become incredibly valuable. The need for higher grade and low impact mines will become even more imperative.

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FRA: C8MQ
TSX-V: HAN

Shares outstanding: 92.2 million
Options: 4.6 million
Warrants: 14.5 million
Fully diluted: 111.4 million

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Hannan Metals Limited

ION Energy

Mongolia‘s first lithium developer gets off to an immediate start

Ali Haji, CEO

ION Energy is a junior Canadian-Mongolian mining development company specializing in the aggressive development of lithium brine projects. The management has a high level of experience with resource projects in Mongolia, which is why ION Energy‘s flagship projects are also located in Mongolia. The company benefits from a first mover advantage and also has the large battery markets of Asia right on its doorstep as potential customers.

Baavhai Uul Lithium Brine Project – Location and Scope

ION Energy‘s flagship Baavhai Uul project is located in southeastern Mongolia, only about 24 road kilometers from the Chinese border and thus from the world‘s largest battery producer. The project site covers 81,000 hectares, making it one of the largest approved exploration licenses and also the first lithium brine license in Mongolia‘s history. The project is located in one of Mongolia‘s largest and also least explored salars.

Baavhai Uul Lithium Brine Project – First Exploration Successes

Baavhai-Uul has high potential for a high-grade lithium brine resource, as drilling has already confirmed. Average lithium grades of 426ppm (parts per million) were detected directly at surface. The highest lithium concentration was 810.6ppm. All holes drilled contained lithium concentrations and also had low potassium and magnesium ratios, favouring the formation of large crystals at the present elevation and sometimes low temperatures. The project area is characterized by extremely high evaporation and concurrent low precipitation. It is a so-called endorheic basin, which has no outflow into external water bodies or the sea. Furthermore, it contains shallow aquifers. Such volcanic and sedimentary rocks from the Cretaceous period are the most suitable aquifers for the enrichment of lithium. Another advantage that lithium brine deposits have is that they are cheaper to extract than hard rock projects.

Baavhai Uul Lithium Brine Project – Current Exploration Work

The Company has recently commenced a geophysics program (CSAMT) followed by a seismic program. In addition, they have acquired a truck mounted drill rig capable of drilling to depths of 20 metres. Initial targets were 5 known salars drilled in June and July 2021, with an initial total of 21 holes drilled for a total of 823.2 metres. The collection of core samples, sediments and surface brine from the aquifers was completed and submitted to SGS Laboratories in Ulaanbaatar, Mongolia for analysis of the results which will be evaluated in the coming months.
The drilling program undertaken was initially focused on stratigraphic drilling to locate the aquifers. Now that these have been located, the Company will re-apply hydrogeological sampling techniques to ensure that brine samples can be collected from specific depths using PVC-lined holes without cross-contamination with the aquifers or surrounding rocks. All holes will be drilled before the end of the year and results will be announced as soon as they arrive from the laboratories.

Urgakh Naran Lithium Brine Project

In February 2021, ION Energy acquired the Urgakh Naran Lithium Brine Project, which covers approximately 19,000 hectares and is located approximately 150 kilometres west-northwest of Baavhai-Uul. Previous work conducted at the project site included an extensive hydrochemical sampling program of identified shallow brine lithium. Although still at an early stage, this program has been extremely successful in identifying several targets for follow-up exploration. ION Energy commenced a drilling campaign in September 2021, which consists of 73 shallow auger holes on a wide 1 kilometre by 1 kilometre spacing. The wells have been drilled to a depth of approximately six metres. Potentially lithium-bearing clays and evaporites will be sampled in each hole, as well as lithium brines intersected in these shallow holes. The main body of the Urgakh Naran Salar is approximately 10 x 3 kilometres in size.

Mining-friendly Mongolia with unexplored raw material potential and great locational advantages

Mongolia is generally considered a very mining-friendly country. Overall, Mongolia‘s mining industry contributes 20% to Mongolia‘s GDP and 80-90% to the country‘s exports. The big advantage is that it is a neighbour of two huge markets: China & Russia. For the commodity companies, especially the low transport costs to the Chinese commodity markets are a big location advantage. Moreover, there has been no historical exploration of battery metals for decades. The current government emphasizes an investment-friendly environment: the Mongolian People‘s Party (MPP) won another resounding victory in 2020, with a majority mandate for four years. Low corporate tax and government royalties are the result. The government‘s anti-investment rules were lifted in 2014. The country has untapped and unlimited potential for lithium: no historical exploration in and new, under-explored projects for battery minerals, but at the same time a geologically well-equipped and high-quality destination or jurisdiction.

Strong analyst coverage

Although ION Energy is still in its infancy, three analyst firms – Couloir Capital, Stonegate Capital and First Republic Bank – have already put out feelers for ION Energy. So far, price targets of 88 to 96 Canadian cents per share are in play.

Strong management team

ION Energy has a very strong management team that has successfully operated in Mongolia for over a decade and has over 100 years of combined mining and exploration experience.
Chairman Matthew Wood is also currently Chairman of Steppe Gold. He was also the founding Chairman of Avanco Resources (sold in March 2018 for AU$440 million) and HunnuCoal (sold in 2012 for US$500 million).
CEO Ali Haji is a current Director of Antler Hill Mining Ltd and Spirit Banner II Capital Corp. he has over 13 years of international experience in asset management, risk analysis and program governance. He is also an advisor to ATMA Capital Markets Ltd and Steppe Gold and holds a BSc from the University of Western Ontario.
Director Bataa Tumur-Ochir is a Mongolian national who serves as CEO and Director of Steppe Gold. He is an advisor to the Ministry of Mines and Heavy Industry, holds a bachelor’s degree in Business Administration and a Diploma in International Business Administration and Marketing from Australia and Singapore.
Director Enkhtuvshin Kishigsuren has over 30 years of experience in resource projects for multinational companies. He has discovered several prospective gold, molybdenum and copper deposits, including the multi-million-ounce Olon Ovoot gold deposit.
Consultant Paul Fornazzari has been involved in the lithium industry since 2008 when he was the initial Chairman of Lithium Americas Corp. (currently under mine construction with its partner Ganfeng Lithium) and secured the initial strategic investments from Mitsubishi and Magna International that helped launch this world class lithium brine plant. Subsequently, he was a director of Neo Lithium Corp. (currently in the take-over phase). He has been involved in the resource industry for many years and has gained insight and experience in the company formation process through various directorships and as legal counsel.

Consultant Don Hains is President of Hains Engineering Company Limited and Managing Director of Hains Technology Associates. He is an industrial mineral exploration and economic geologist with more than 30 years of experience in the exploration, development, exploitation and analysis of industrial mineral properties and materials. He has a particular focus on critical and energy-related minerals such as lithium, working on projects around the world, including lithium and other industrial mineral projects in China and Mongolia. His lithium experience spans all types of deposits, processing routes and stages of project development from exploration to plant construction. He has authored numerous NI 43-101 technical and due diligence reports on lithium projects in Canada, the United States, South America, Africa, Europe, the Middle East and Asia.

Dr. Khashbat Dashteseren also joined ION Energy's advisory team in February 2021. Dr. Dashteseren is a geologist and scientist with extensive experience in the exploration of various minerals in Mongolia and has worked for the Ministry of Urban Development and Investment in Mongolia. Dr. Dashteseren was also the Chief Geologist at Geolink LLC prior to assuming the role of CEO. Subsequently, Dr. Dashteseren worked as an exploration manager for Resource Partners Group. He also spent a significant amount of time researching laboratory analytical methods for lithium at Akita University in Japan.

Summary:
The first bullseye could become an instant game-changer

The lithium market is currently hot, which is impressively proven by the two acquisitions of Millennial Lithium and NeoLithium. China in particular is desperately looking for attractive lithium deposits. Therefore, ION Energy was one of the first to recognize the great location advantages of Mongolia. Above all, the proximity to the largest battery market, China, is virtually unbeatable. ION Energy's management team is considered a pioneer in the mining industry in Mongolia and has been operating in the country for more than 10 years. During that time, they have been able to identify potentially high-grade lithium deposits and ultimately secured the current flagship Baavhai-Uul project as well as Urgakh Naran. Both projects are so huge that they could even host multiple high-grade lithium brine deposits. If proof of this is achieved from 2022, exceedingly low-cost lithium production could be established, also due to the special climatic conditions (high evaporation, hardly any precipitation). The company is sufficiently financed for the coming months (in March and April 2021, CA$ 5.75 million in fresh funds were generated through an oversubscribed financing) and should provide a continuous news flow from exploration activities in the near future.

Exclusive interview with Ali Haji, CEO of ION Energy

What have you and your company achieved in the past 12 months?

We recently celebrated our 1-year anniversary of trading on the TSX-V, and our team is really proud of what has been achieved in the past 12 months.

Within six months ION Energy had: listed publicly on the Frankfurt Stock Exchange, strengthened our team with technical expertise and leading industry names, increased our access to US investors by upgrading to the OTCQB, and acquired an additional licence, so that the land mass of our licences reached 100,000-plus hectares. ION Energy is proud to be the first mover and the largest lithium explorer in Mongolia!

This exhilarating trajectory continued with completing a $5.75 million public offering, after initially announcing a $3 million placement and receiving unprecedented demand from institutional investors. Through this, ION Energy was able to ensure that our exploration activities have been fully funded for 2021.

This summer we completed the maiden drilling program at our flagship Baavhai Uul Lithium Brine project, and recently announced the commencement of our maiden exploration program at our Urgakh Naran Lithium Brine project.

What are the most important company catalysts for the next 6 to 12 months?

Now that our team has achieved the key foundational pieces of our aggressive growth strategy, we are now entering the most important phase for ION Energy: proving that we have what we say we have.

We expect sampling at both, Baavhai Uul and Urgakh Naran, to be completed by early 2022 to reach an early resource indication which will give a clear understanding of the resource and chemistry. We will also engage with strategic partners, ideally already known within the EV and battery metals mining value chain, and we hope to leverage their intellectual capital to better understand the profile of our assets.

ION Energy intends to be a key player within the Asian supply chain hub, which will allow Asian manufacturers to obtain the necessary lithium for battery manufacturing within their own continent.

How do you see the current situation on the market for battery metals?

With COP26 behind us, there is no government that isn't putting climate change and the Green Revolution at the forefront of their economic recovery strategies. We've already seen this with billions of dollars of electrification announcements around the world.

The benchmark index for battery metals is already more than double in 2021, and with current supply chain issues, Asian lithium prices are currently hitting records. All of this points to the inevitable supply not meeting increased demand trends to continue, and ION Energy welcomes the opportunity to be part of the continental supply chain.

ION Energy Ltd.

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FRA: 5YB
TSXV: ION

Shares outstanding: 60.2 million
Options: 3.7 m
Warrants: 20.6 m
Fully diluted: 84.5 million

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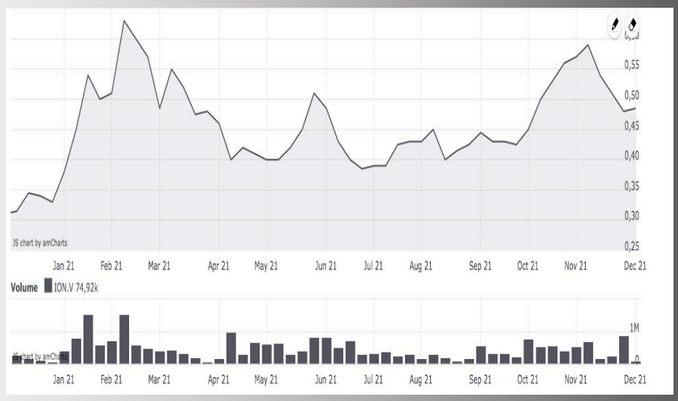


Kutcho Copper

Top project, top partner and top feasibility study

Vince Sorace, CEO

Kutcho Copper is a Canadian mining development company that specializes in developing high-grade copper deposits in British Columbia. There, the company was able to secure the eponymous Kutcho Copper project, which not only hosts a resource, but already an appealing reserve. A fresh feasibility study has already come to an extremely positive conclusion and taken a lot of risk off the project. Kutcho is thus already very far advanced and could soon attract potential takeover bidders. The company already has a strong development partner in Wheaton Precious Metals.

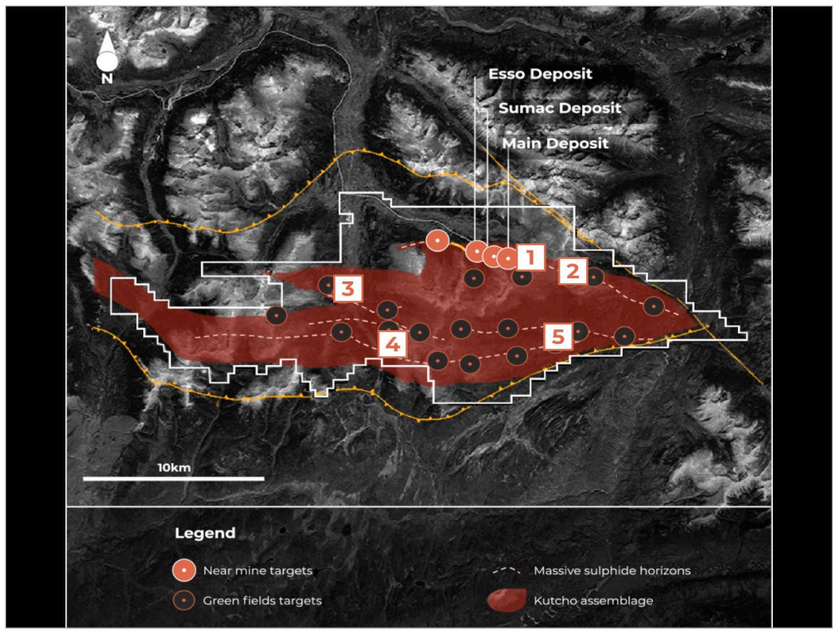
Kutcho Copper Project – Location and Infrastructure

The flagship Kutcho project is located approximately 100 kilometres east of Dease Lake in northern British Columbia and consists of a mining lease and 46 mineral exploration claims covering an area of approximately 17,060 hectares. The site is accessible by a 900-metre gravel runway for small aircraft located 10 kilometres from the deposit and a 100-kilometre seasonal road from Dease Lake suitable for tracked and light duty vehicles. A deep-water port is located in Stewart, approximately 400 kilometres from Dease Lake. Existing infrastructure has been greatly improved over the past 10 years with numerous infrastructure improvements. Among other things, Highway 37 runs through northern British Columbia.

Kutcho Copper Project – Geology and Mineralization

The Kutcho Copper Project lies within the King Salmon Allochthon, a narrow belt of Permo-Triassic island arc volcanic rocks and Jurassic sediments that lies between two north-dipping overthrust folds: the Nahlin fault to the north and the King Salmon fault to the south. The belt of volcanic rocks is thickest in the area where it hosts the VMS deposits, due in part to primary deposition but also to stratigraphic repetition by folding and possibly overthrusting. The volcanic rocks are folded, and triple repeat the mineralized horizon on the project, including the deposit. The massive sulphide deposits are oriented east-west and dip 15° to the west.

Mineralization comprises three known „Kuroko-type“ VMS deposits aligned on a west-dipping linear trend. The largest, the Main deposit, comes to surface at the eastern end, followed by Sumac at depth and Esso at the western end, which occurs at a depth of approximately 400 metres below surface. „Kuroko-type“ VMS deposits are typically associated with felsic volcanism in island arc or back-arc tectonic settings. The characteristics of Kutcho-type deposits indicate that they formed at or near the water-soil interface in a structurally controlled depression, for example, in a „half-graben“ type structure. The chemical composition of the alteration around the Kutcho deposits is well zoned around the hydrothermal vent zones. Mineralization consists of a pyritic footwall with zoned copper and zinc towards a sharp hanging wall contact.



(Source: Kutcho Copper)

Kutcho Copper Project – Reserves and Resources

The Kutcho Copper Project already has a high-calibre reserve and resource base, mainly from the Main Zone. A 2017 estimate indicated a potential reserve of 10.4 million tonnes averaging 2.01% copper, 3.19% zinc, 34.61g/t silver and 0.37g/t gold.

The most recent resource estimate to date, from September 2021, produced measured and indicated resources of 22.8 million tonnes averaging 1.52% copper, 2.18% zinc for 765 million pounds of copper, 1.1 billion pounds of zinc, plus 288,000 ounces of gold and 20.6 million ounces of silver. In addition, there are inferred resources of 12.9 million tonnes averaging 1.10% copper and 1.58% zinc plus gold, silver and lead.

Kutcho Copper Project – Exploration Potential

The Kutcho Copper Project has great exploration potential.

The Main-Sumac Gap identifies a 400-metre-wide gap between the Main and Sumac lenses that has not yet been drill tested. A conductive geophysical anomaly coincides with this area and is 360 metres long. The easternmost hole, which intersected the Sumac lens and is located on the western edge of the gap, returned 5.12 metres at 1.29% copper, 0.49% zinc and 7g/t silver.

The Footwall Zone is stratigraphically below the Main Zone and represents a stacked massive sulphide horizon open in all directions. The last hole drilled to the east and down dip intersected 1.5 metres of 3.54% copper, 6.94% zinc, 316.9g/t silver and 1.47g/t gold.

MCF is located at the eastern end of the main deposit and coincides with a conductive VTEM geophysical anomaly and a copper-zinc soil anomaly. Three historic drill holes returned approximately 35 metres of semi-massive sulphide, while one hole intersected long intervals of strongly altered lapilli tuff with 2-8% pyrite, traces of chalcopyrite and sphalerite.

Overall, 36% of the Main Zone, 50% of the Esso Zone and 100% of Sumac remain open down dip and outside of the current resource model.

In addition to the nearby Main Zone deposits, the project area hosts a number of other greenfield targets that remain to be explored. These include the so-called IRJ Northwest, which was first identified as a conductor in a ground-based survey in 1990 and tested with two drill holes. The holes intersected strongly altered and weakly copper mineralized intervals as well as a thick sequence of altered lapilli and ash. The size and strength of alteration in both holes indicates a prospective target down dip from previous drilling.

In the IRJ Northeast area, three holes drilled in 1990 returned massive to semi-massive sulphide layers up to 1 metre wide associated with clayey material. One of the holes returned approximately 3 metres of what is

known as a stringer zone averaging 20% pyrite containing some massive bands and returned 7.3 metres at 0.27% copper with a high sample of 0.45% copper. The geochemical trends indicate that the hydrothermal vent area is located further east and target acquisition should focus on this vector. In addition, there are several other promising target areas. In October 2021, Kutcho Copper indicated that there are several open pit and underground targets at the Main, Sumac and Esso deposits that have the potential to expand the open pit and underground mineral resources beyond those being considered for inclusion in the Feasibility Study.

Kutcho Copper Project – Feasibility Study

In November 2021, Kutcho Copper published a positive feasibility study for the Kutcho Copper Project. The study was based on a copper price of US$3.50 per pound and a zinc price of US$1.15 per pound. A production capacity of 4,500 tonnes per day (tpd) and a production capacity of 3,900 tpd resulted in an after-tax NPV 7% of CA$461 million and an after-tax IRR of 25%. Initial capital costs were estimated at CA$483 million and all-in sustaining costs at US$1.80 per pound of copper equivalent. With an estimated mine life of 8 years and a production life of 10.75 years, there would be an after-tax cash flow of CA$841 million. The payback period was calculated to be 3.4 years.
Assuming current prices of US$4.50 per pound of copper and US$1.57 per pound of zinc, this would result in an after-tax NPV of CA$931 million and an IRR of 41%.

Development deal with Wheaton Precious Metals

To rapidly develop the Kutcho Copper Project, Kutcho Copper was able to enter into a US$100 million development deal with silver-streaming company Wheaton Precious Metals. As part of its 2017 acquisition of the Kutcho Project from Capstone Mining, Kutcho Copper, still under its former name Desert Star, received a commitment from Wheaton Precious Metals to receive up to US$100 million in total. In return, Wheaton Precious Metals is entitled to acquire 100% of the silver and gold production from the Kutcho Project until 5.6 million ounces of silver and 51,000 ounces of gold have been delivered, at which time the interest will decrease to 66.67% of silver and gold production for the life of mine. Wheaton Precious Metals will make an ongoing cash payment equal to 20% of the respective spot price of silver and gold for each ounce delivered under the agreement. Since entering into the agreement, Wheaton Precious Metals has committed US$7 million to fund the feasibility study. A further US$58 million has been paid to develop the project. Kutcho Copper will receive up to US$20 million more if it expands to a 4,500 tpd operation. Further, Kutcho Copper executed a CA$4 million financing with Wheaton Precious Metals in December 2017. Kutcho Copper also received a CA$20 million loan from Wheaton Precious Metals.
It is important to note that only about 8% of the estimated project revenues are affected by the stream. 61% of the planned generated revenues are attributed to copper, 31% to zinc, 5% to silver and 3% to gold in the future.

Summary: Feasibility study convinces

Kutcho Copper already has an attractive resource base at its copper project of the same name, although the site has yet to reveal its vast resource potential. Several potentially high-calibre exploration areas are waiting to be explored. The recent positive feasibility study could take a lot of risk off the project and could possibly attract other interested parties besides top development partner Wheaton Precious Metals to what is arguably one of the most exciting copper-zinc projects in the world. In June 2021, Kutcho Copper was able to generate CA$4.1 million in fresh capital via a financing. Furthermore, in July 2021, the company announced that it had started negotiations on economic participation agreements with the two affected First Nations, Kaska and Tahltan.

Exclusive interview with Vince Sorace, CEO of Kutcho Copper

What have you and your company achieved in the past 12 months?

- We have announced Multiple feasibility updates
- We have announced the buy back of one of the royalties on the project including termination of a historical ROFR on the offtake
- We have announced an updated resource estimate containing 22.8 mt in M&I grading 2.25% CuEq representing over 1.1 billion pounds of copper
- We announced commencement of negotiations of economic participation agreements with First Nations

What are the most important company catalysts for the next 6 to 12 months?

- We are planning for a big exploration (resource expansion) program in 2022, and continue working on completion of permitting towards production

How do you see the current situation on the market for battery metals?

- We are amidst a “Green revolution” and decarbonization which will be a major contributor to copper’s increased demand in the EV industry, renewable energy and technologies.

- The Copper industry is in a paradox right now. We have seen miners’ costs increasing exponentially, grade curves declining significantly, and very few new mines coming online – big copper mines can take 20 years by the time they are discovered, permitted and built.

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FRA: 1QV
TSX-V: KC

Shares outstanding: 98.2 million
Options: 8.5 million
Warrants: 15.3 million
Fully diluted: 122.0 million

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Kutcho Copper Corp.

Standard Lithium

Innovative Lithium Mining and CO_2 Extraction

Robert Mintak, CEO

Standard Lithium is a Canadian mining development company that specializes in the development of high-grade lithium deposits in the USA. In doing so, the company increasingly relies on new technologies to extract lithium in a relatively environmentally friendly way, which shortens the corresponding permitting processes and thus provides the company with an additional time advantage. Standard Lithium's proprietary technologies for direct lithium extraction and AI-assisted lithium crystallization are key to the development of a globally significant domestic critical mineral resource in the US. It also recently closed a deal to develop an efficient CO_2 extraction process and a US$100 million financing package.

Arkansas Smackover Lithium Project – Cooperation with LANXESS

Standard Lithium has had a collaboration with LANXESS Corporation (Bayer spin-out) since 2018, with the goal of testing and proving the economic viability of extracting lithium from tail-brine in the U.S. state of Arkansas, produced by LANXESS' bromine extraction business at its three plants in southern Arkansas. LANXESS' operations in southern Arkansas cover 150,000 acres that include 10,000 brine leases. LANXESS extracts brine from wells located throughout the region, and the brine is transported through a network of 250 miles of pipelines to three facilities where the brine is processed for bromine recovery, with the final brine then reinjected into the aquifer. The three bromine extraction plants employ about 500 people, have been in operation for nearly five decades, and produce about 5.3 billion gallons of brine annually.

Arkansas Smackover Lithium Project – Resource Estimate

The latest resource estimate for the project area, developed in conjunction with LANXESS, revealed in June 2019 that it has at least 3.140 million metric tonnes of lithium carbonate equivalent in the indicated category.

Arkansas Smackover Lithium Project – PEA

Also in June 2019, Standard Lithium released a preliminary economic assessment (PEA) for the Arkansas Smackover Lithium Project. This identified a pre-tax net present value (NPV) of US$1.3 billion at a discount rate of 8% and a pre-tax IRR of 42%.
Total capital costs have been estimated at US$437 million, including a 25% buffer on both direct and indirect capital costs. The mine life is 25 years, with production of 20,900 tonnes battery grade lithium carbonate per year when all three plants are operating (production ramped up to full capacity over 5 years). Non-optimized reagent cost per ton of lithium carbonate was determined to be US$3,107. All-in operating costs, including all direct and indirect costs, working capital, insurance and mine closure costs are estimated at US$4,319 per tonne of lithium carbonate.

Arkansas Smackover Lithium Project – Proprietary Patent Pending Technologies

Standard Lithium plans to use two of its own patent-pending extraction technologies. The direct lithium extraction LiSTR (abbreviation for Lithium Stirred Tank Reactor) and the lithium carbonate crystallization SiFT. With LiSTR, lithium ions are selectively extracted from raw brine, which means that no pre-concentration is necessary. The technology can be used regardless of weather conditions and guarantees a very fast production within hours instead of months as is the case with „normal" evaporation operations. This results in a much smaller environmental footprint, as only a few dozen hectares are required compared to thousands of hectares, and all lithium-free brine is returned to the aquifer. The proven bolt-on process utilizes the approved infrastructure of the largest brine processing facilities in North America, which is why implementation can occur relatively quickly. SiFT is a continuous crystallization process controlled by artificial intelligence to produce Li_2CO_3 of the highest purity of over 99.9% for next generation lithium-ion batteries.

Standard Lithium's proprietary LiSTR direct extraction technology is key to developing the U.S. resource.
(Source: Standard Lithium).

Arkansas Smackover Lithium Project – commercial scale pilot plant + conversion process + successful production of high purity lithium carbonate

The company's world's first Direct Lithium Extraction Demonstration Plant is installed at LANXESS' South Plant near El Dorado, Arkansas. The demonstration plant utilizes LiSTR technology and is designed to continuously process an input brine flow of 50 gallons per minute from the LANXESS South Plant, which equates to an annual production of 100-150 tons of lithium carbonate.
To further de-risk the South Arkansas project, the Company is also conducting a two-pronged test program for the conversion of lithium chloride to lithium carbonate.
The Company's large-scale lithium carbonate SiFT crystallization pilot plant, which had been operating successfully since mid-July 2020, has also now arrived in El Dorado. This uses a lithium chloride solution produced at the Company's mini-pilot direct lithium extraction plant. The SiFT plant has produced high purity lithium carbonate crystals from this lithium chloride. In the process, they most recently managed to successfully convert lithium chloride produced in Arkansas into 99.985% pure lithium carbonate.

South-West Arkansas Lithium Project – Acquisition, Location and Resource

In 2018, Standard Lithium entered into an option agreement with TETRA Technologies to acquire exploration rights in the Smackover Formation in Arkansas. This is 36,172 acres of brine licenses in one of the most highly productive brine producing regions in southern Arkansas. Annual brine production

in Arkansas averaged 42.6 million cubic yards from 2010 to 2016. Well-developed infrastructure and low-risk, well-established geology make the project a company-maker. In October 2021, the most recent resource estimate to date for the South-West Arkansas Lithium Project was presented. According to this estimate, the project has at least 1.195 million metric tons of lithium carbonate equivalent in the inferred category.

South-West Arkansas Lithium Project – PEA

Also in October 2021, Standard Lithium released a PEA for the project. The estimate is based on a 20-year mine life with an average production of 30,000 tonnes of battery grade lithium hydroxide monohydrate per year. Operating costs were estimated at US$2,599 per tonne of lithium hydroxide and total capital costs at US$870 million. This results in a net present value (NPV 8%) of US$1.97 billion and an after-tax return on investment (IRR) of 32.1%.

Arkansas Carbon Capture Project

In September 2021, Standard Lithium announced that it will conduct a pilot project in southern Arkansas to test a novel carbon capture technology. The pilot project will be conducted in collaboration with the owner of the technology, Aqualung Carbon Capture AS, and will be installed at a natural gas processing facility in southern Arkansas owned and operated by Mission Creek Resources LLC. Aqualung is the sole licensee of the patent-protected technology, which was developed by the Norwegian University of Science and Technology. The technology is based on a membrane system that selectively extracts CO_2 from a wide range of CO_2 sources emitted by hydrocarbon burning energy sources. This produces a high purity CO_2 gas stream that can either be captured or reused. The technology has been successfully tested in Europe, where it has been shown to effectively extract CO_2 from carbon gas streams. The pilot project will be located at Mission Creek‘s Dorcheat Macedonia facility and will receive an exhaust gas stream for processing at the Aqualung pilot plant. The resulting concentrated CO_2 stream will be used in Standard Lithium‘s ongoing activities to explore the use of CO_2 from southern Arkansas for process and reagent optimization.

Bristol Lake Lithium Project

Standard Lithium‘s second prospective project is called Bristol Lake and is located in the Mojave region of San Bernadino County, near the town of Amboy in southeastern California. Amboy is located on old Route 66, near the current Interstate Highway 40, and is 200 kilometers from Las Vegas and about 330 kilometers from the Port of Los Angeles. There is also an active railroad line within 5 kilometers. Through several acquisitions, Standard Lithium has secured a total of over 45,000 acres of license area within the Bristol Lake area and Cadiz Dry Lake, 20 kilometres away. Bristol Lake is a classic salt lake with significant lithium content, but was not previously part of the production strategy. Historical drilling by the United States Geological Survey encountered 110 mg/L lithium in corresponding brines. Within the Cadiz Dry Lake, lithium grades between 112 and 139mg/L have been detected in corresponding sampling. The fact that chloride has been mined there for over 100 years makes Bristol Lake one of the most infrastructurally developed projects in North America. At the same time, the project has a high exploration potential for the raw material lithium. After all, up to now only chloride has been mined by the previous producers, while the significant lithium content has not been considered at all. This results in not only a high exploration potential but also a high production potential for lithium and possible by-products. Standard Lithium has already carried out evaporation tests there. It turned out that the brine originally contained an average lithium content of 146mg/L. After four weeks, the lithium content concentrated to an average of 686mg/L only due to passive evaporation. In 2018, Standard Lithium conducted a large-scale gravity geophysical survey in the Cadiz Dry Lake area which concluded that it was a backfilled basin with a maximum depth of 700 metres.

Summary: More full throttle is not possible

Standard Lithium has demonstrated two separate crystallization flowsheets capable of converting lithium chloride from the Smackover formation brine into high purity battery grade lithium carbonate. As the Company continues to move towards commercialization, the successful demonstration of alternative technologies in key areas of the flowsheet enables a reduction in project execution risk and provides greater flexibility with respect to the final flowsheet that will be deployed at commercial scale. The collaboration with major partner LANXESS is expected to quickly elevate Standard Lithium into entirely different realms. At the latest when the commercial phase of the joint venture is underway.
Together with the second project in Arkansas, Standard Lithium has more than 4 million metric tons of lithium carbonate equivalent in the Arkansas Smackover. This is the largest lithium brine deposit in the United States. This is so special because the US classifies lithium as a particularly critical and strategic metal and is focused on being as independent as possible from corresponding imports. Therefore, Standard Lithium holds all the aces and could soon be targeted by one of the big players in the industry. The listing on the NYSE and the inclusion in the VanEck Vectors Rare Earth/Strategic Metals ETF provided additional attention among investors. The blockbuster deal for a direct US$100 million financing with Koch Investments brings the company a lot of cash that can be used to develop lithium production.

ISIN: CA8536061010
WKN: A2DJQP
FRA: S5L
TSX-V: SLL

Shares outstanding: 141.2 million
Options/Warrants: 23.6 million
Fully diluted: 164.8 million

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Standard Lithium Ltd.

Surge Copper

Around 7 billion pounds of copper equivalent under one hat and real experts at work

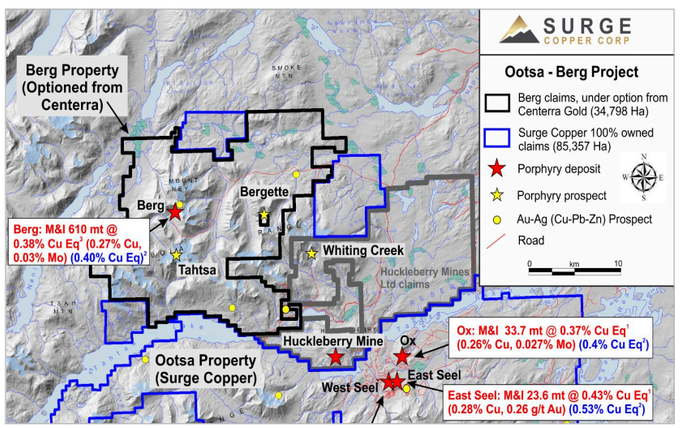
Leif Nilsson, CEO

Surge Copper is a Canadian mining development company specializing in the development of high-grade copper deposits in British Columbia. There, they hold majority stakes in two copper projects that are directly adjacent to each other and cover a total of around 122,000 hectares. The entire area is rich in copper, molybdenum, gold and silver and is also well developed in terms of infrastructure. Surge Copper is working aggressively to further increase the already very large resource base.

Ootsa – Location and infrastructure

The Ootsa project, which is 100% owned by Surge Copper, is located approximately 120 kilometres south of the city of Houston, British Columbia and has good all-weather road access. The claims, totaling approximately 87,000 hectares, contain a network of logging roads that provide excellent road access through the central and eastern portions of the claim block. Ootsa is bordered to the north by the Huckleberry mine and mill complex, which is owned by Imperial Metals Corporation, is currently in care and maintenance status and hosts only minor remaining reserves. Ootsa has a 35-man exploration camp that is typically operational from May to November. However, the relatively mild climate allows for year-round exploration activity.

Surge Copper sucessfully consolidated the Ootsa and Berg Copper Projects in British Columbia.
(Source: Surge Copper)).



The East and West Seel deposits represent two distinct styles of porphyry mineralization that form a large contiguous mineralized zone. The deposits are located in a gently dipping area of confined bedrock, only about 6 kilometres from the Huckleberry Mill. The East Seel deposit is a smaller, higher grade mineralized zone containing copper-gold mineralization associated with quartz-magnetite-chalcopyrite veins. The West Seel deposit is a large zone of copper-gold-molybdenum-silver mineralization associated with quartz-pyrrhotite-chalcopyrite-molybdenite veins that extends from surface to a depth of over 1,000 metres and is not yet fully delineated. Both deposits have high tonnage and copper mineralization, some of which extends for several hundred metres. For example, in the East Seel area, Surge Copper has proven 238 metres of 0.73% copper equivalent and 186 metres of 0.78% copper equivalent. In the West Seel area, intersections included 817 metres of 0.45% copper equivalent, 1,013 metres of 0.42% copper equivalent, 830 metres of 0.38% copper equivalent, 432 metres of 0.61% copper equivalent, as well as 585 metres of 0.57% copper equivalent, 495 metres of 0.54% copper equivalent and 194 metres of 0.76% copper equivalent. In total, Surge Copper drilled 24,000 metres at Ootsa in 2021.

Ootsa – geology and resource

Ootsa hosts at least three advanced copper-gold-molybdenum-silver porphyry deposits located in the northeast portion of the project area.

The third advanced deposit is called Ox and is located approximately 4 kilometres northeast of East and West Seel and contains a crescent-shaped zone of disseminated and vein-controlled porphyritic copper-molybdenum mineralization. This mineralization contains pyrite, chalcopyrite and molybdenite occurring in hornfelsic sedimentary rocks near the western margin of a granodiorite porphyry deposit. There, the Company encountered 359.4 metres at 0.41% copper equivalent and 227.7 metres at 0.53% copper equivalent, among others. In the summer of 2021, Surge Copper conducted minor drilling there to test several targets.

For all three advanced deposits combined, Surge Copper last published a resource estimate in early 2016 based on over 350 drill holes totaling 144,000 metres of drilling. According to this, Ootsa has a total of 1.109 billion pounds of copper, 1.062 million ounces of gold, 104 million pounds of molybdenum and 20.457 million ounces of silver within these deposits alone. Converted, this equates to approximately 1.85 billion pounds of copper equivalent. All drilling conducted after 2016 is not included in this estimate. The Company plans to prepare a new resource estimate by the end of 2021.

In addition, Ootsa has at least 7 other potentially high grade deposits that have already produced some high grades. For example, Troitsa Peak, where historical sampling has produced up to 41g/t gold and 9,238g/t silver, or the Hope Prospect, which has historically produced up to 6.3% copper and 1,305g/t silver in a 700 metre by 50 metre area.

Ootsa – PEA

A PEA also dates from 2016. This was based on – from today's perspective – extremely conservative commodity prices of US$3.00 per pound of copper, US$1,260 per ounce of gold, US$10.30 per pound of molybdenum and US$17 per ounce of silver. In addition, only about one-third of the total resource was factored in. The result was an after-tax net present value (NPV/5% discount) of CA$186 million and an internal rate of return (IRR) of a sensational 81%. Accordingly, the mine life is 12 years, and the payback period is 1 year. The basis was the assumption that Ootsa can be exploited by contract mining and toll milling in the Huckleberry Mill, which is why the initial capital costs – for this type of mine – would be a measly CA$64 million.

Ootsa exploration camp
(Source: Surge Copper)

At present, all assumed raw material prices are in part far above those from the PEA, which is why the economic viability of the project can currently be assessed as even better.

Ootsa – Current work and catalysts

Surge Copper's current focus is clearly on expanding resources and improving economics. Additional drilling outside the current resource area has the potential to significantly increase tonnage. The target is a large pit covering the deeper high-grade area at West Seel. In addition, the newly formed management sees increased potential for a higher grade, lower strip ratio extension. The coming weeks and months should be dominated by drill results, an update on the resource estimate and metallurgical optimization. In addition, the Company will evaluate the extent to which the recently acquired Berg Project will have a positive synergistic effect on the data at hand.

Berg – acquisition and location

In December 2020, Surge Copper announced that it had entered into a definitive option agreement with Thompson Creek Metals Company Inc, a wholly owned subsidiary of Centerra Gold Inc, giving Surge Copper the right to earn a 70% interest in the Berg copper-molybdenum-silver project. This requires Surge Copper to transfer CA$5 million worth of common shares and make capital expenditures of CA$8 million over 5 years. Berg hosts a large porphyry copper-molybdenum-silver deposit located approximately 28 kilometres northwest of Ootsa. Berg totals 34,798 hectares is directly adjacent to Ootsa and was expanded again in April 2021 to include the Bergette Claims in the eastern area and the Sylvia Claims in September 2021.

Berg – Resource

Berg hosts several near-surface and high-grade zones potentially suitable for low-grade mining. Historical metallurgical studies indicate suitability for conventional flowsheets for the production of copper and molybdenum concentrates. Some of the existing drilling, which includes 176 metres at 0.75% copper equivalent and 63 metres at 1.44% copper equivalent, is widely spaced. In addition, the main deposit remains open at depth and radially outward.

In March 2021, Surge Copper released a resource estimate that truly had it all. So, Berg has 3.65 billion pounds of copper, 419 million pounds of molybdenum, and 59.1 million ounces of silver in the measured and indicated categories. In total, this equates to 5.126 billion pounds of copper equivalent.

Berg – Current work and catalysts

In 2021, the access road to the Berg camp was expanded, making Berg accessible to heavy vehicles for the first time in 10 years. Another important item is the review of existing drill core and drill core waste for precious metals, as approximately half of the historical drilling has not assayed for silver and none at all for gold. This should better define the higher-grade zones and reveal the best geochemical and geophysical anomalies. In September 2021, Surge Copper launched a drilling campaign that is expected to include 15 holes totaling 4,500 metres. The objectives of the program include upgrading the drill hole database, including orientation surveys and full geochemical analysis data, improving the understanding of structural influences on mineralization, and improving drill hole density in the high-grade areas of the deposit.

Summary: News flow guaranteed by drilling

Nearly 7 billion pounds of copper equivalent, with above average grades, including over one million ounces of gold alone. Two huge project areas, contiguous and including an inactive but reactivatable processing plant on two sides. A PEA that is no longer quite so recent, but which delivered very good results, and at commodity prices that are in some cases far below current ones, and which included only a fraction of the resources of the much smaller deposit. An exploration potential that is not only based on possible additional deposits, but also on the fact that the re-evaluation of historical drill cores alone could give an additional boost in terms of the by-products. A new resource estimate for Ootsa, incorporating all drill results from 2020 and 2021, to be completed by the end of the year. A newly formed management team that has already impressively demonstrated in the past that it can both land large new discoveries and fund large sums of money. All of this, combined with a rapidly increasing demand for copper and silver in the foreseeable future, makes for an explosive mix that could catapult Surge Copper into entirely different price spheres. Thanks to a well oversubscribed CA$14 million financing in June 2021, Surge Copper is adequately funded for the extensive exploration activities ahead.

Exclusive interview with Leif Nilsson, CEO of Surge Copper

What have you and your company achieved in the past 12 months?

The last year has been one of the busiest periods in the company's history. We have raised about C$20 million in new equity capital, completed several transactions to successfully consolidate a 1,200 square kilometre land package surrounding the idled Huckleberry mine and mill, commissioned the first ever deep imaging airborne geophysical survey over the district, and completed one of the largest drill programs in the company's history across two separate project areas. We have also made several important appointments to the company's board and management team over the last twelve months, so it is a new team with a deep skill set that is working to advance these assets.

What are the most important company catalysts for the next 6 to 12 months?

As we look forward over the next 6 to 12 months, our focus is turning to a few new priorities which are to update the resource estimate at our Seel deposit which has seen the majority of the drilling over the last year, to advance our regional target drilling program which will benefit from the newly acquired geophysical data, and to advance some engineering programs on both the Ootsa and Berg projects. The most important catalyst to come out of that work will likely be the resource update or any major new discoveries that result from our district scale exploration activity.

How do you see the current situation on the market for battery metals?

The market feels incredibly well positioned right now. Some of the present price action in the electrification metals may be influenced by global supply chain issues that are affecting every sector, but the long-term supply and demand outlook is excellent and should put very solid support into prices for copper, nickel, and other key metals. The M&A markets have also started to heat up in the second half of the year, showing that many of the world's major mining companies are looking to reposition their portfolios to increase exposure to these metals. This is a trend that has decades left to run. It is very exciting to be advancing a high-quality asset base in these market conditions.

Surge Copper Corp.

ISIN: CA86881M1041
WKN: A2JENX
FRA: G6D2
TSX-V: SURG

Shares outstanding: 164.8 million
Options/Warrants: 70.5 million
Fully diluted: 235.3 million

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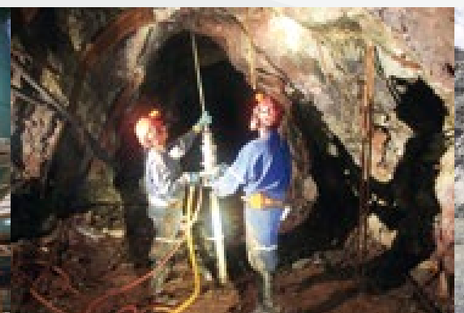


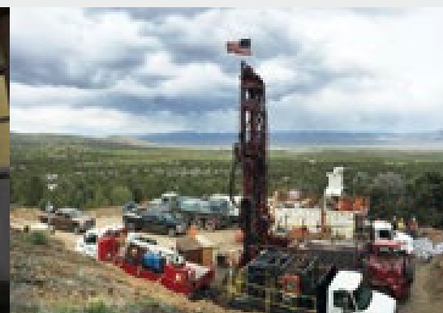

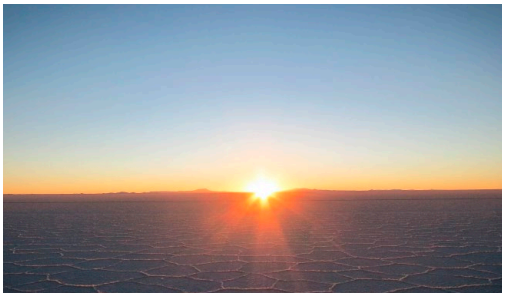

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