



Battery Metals Report 2020

Everything you need to know about the Battery Metals
Lithium, Cobalt, Nickel and Vanadium!



Disclaimer

Dear reader,

Please read the complete disclaimer in the following pages carefully before you start reading this Swiss Resource Capital Publication. By using this Swiss Resource Capital Publication you agree that you have completely understood the following disclaimer and you agree completely with this disclaimer. If at least one of these point does not agree with you than reading and use of this publication is not allowed.

We point out the following:

Swiss Resource Capital AG and the authors of the Swiss Resource Capital AG directly own and/or indirectly own shares of following Companies which are described in this publication: Defense Metals, Giga Metals, Lithium Chile, Mali Lithium, Milennial Lithium, Neolithium, Plateau Energy Metals.

Swiss Resource Capital AG has closed IR consultant contracts with the following companies which are mentioned in this publication: Millennial Lithium.

Swiss Resource Capital AG receives compensation expenses from the following companies mentioned in this publication: Defense Metals, Giga Metals, Lithium Chile, Mali Lithium, Milennial Lithium, Neolithium, Plateau Energy Metals.

Therefore, all mentioned companies are sponsors of this publication.

Risk Disclosure and Liability

Swiss Resource Capital AG is not a securities service provider according to WpHG (Germany) and BörseG (Austria) as well as Art. 620 to 771 obligations law (Switzerland) and is not a finance company according to § 1 Abs. 3 Nr. 6 KWG. All publications of the Swiss Resource Capital AG are explicitly (including all the publications published on the website <http://www.resource-capital.ch> and all sub-websites (like <http://www.resource-capital.ch/de>) and the website <http://www.resource-capital.ch> itself and its sub-websites) neither financial analysis nor are they equal to a professional financial analysis. Instead, all publications of Swiss Resource Capital AG are exclusively for information purposes only and are expressively not trading recommendations regarding the buying or selling of securities. All publications of Swiss Resource Capital AG represent only the opinion of the respective author. They are neither explicitly nor implicitly to be understood as guarantee of a particular price development of the menti-

oned financial instruments or as a trading invitation. Every investment in securities mentioned in publications of Swiss Resource Capital AG involve risks which could lead to total a loss of the invested capital and – depending on the investment – to further obligations for example additional payment liabilities. In general, purchase and sell orders should always be limited for your own protection.

This applies especially to all second-line-stocks in the small and micro cap sector and especially to exploration and resource companies which are discussed in the publications of Swiss Resource Capital AG and are exclusively suitable for speculative and risk aware investors. But it applies to all other securities as well. Every exchange participant trades at his own risk. The information in the publications of Swiss Resource Capital AG do not replace an on individual needs geared professional investment advice. In spite of careful research, neither the respective author nor Swiss Resource Capital AG will neither guarantee nor assume liability for actuality, correctness, mistakes, accuracy, completeness, adequacy or quality of the presented information. For pecuniary losses resulting from investments in securities for which information was available in all publications of Swiss Resource Capital AG liability will be assumed neither by Swiss Capital Resource AG nor by the respective author neither explicitly nor implicitly.

Any investment in securities involves risks. Political, economical or other changes can lead to significant stock price losses and in the worst case to a total loss of the invested capital and – depending on the investment – to further obligations for example additional payment liabilities. Especially investments in (foreign) second-line-stocks, in the small and micro cap sector, and especially in the exploration and resource companies are all, in general, associated with an outstandingly high risk. This market segment is characterized by a high volatility and harbours danger of a total loss of the invested capital and – depending on the investment – to further obligations for example additional payment liabilities. As well, small and micro caps are often very illiquid and every order should be strictly limited and, due to an often better pricing at the respective domestic exchange, should be traded there. An investment in securities with low liquidity and small market cap is extremely speculative as well as a high risk and can lead to, in the worst case, a total loss of the invested capital and – depending on the investment – to further obligations for example additional payment liabilities. Engagements in the publications of the shares and products presented in all publications of Swiss Resource Capital AG have in part foreign exchange risks. The deposit portion of single shares of small and micro cap companies and low

capitalized securities like derivatives and leveraged products should only be as high that, in case of a possible total loss, the deposit will only marginally lose in value.

All publications of Swiss Resource Capital AG are exclusively for information purposes only. All information and data in all publications of Swiss Resource Capital AG are obtained from sources which are deemed reliable and trustworthy by Swiss Resource Capital AG and the respective authors at the time of preparation. Swiss Resource Capital AG and all Swiss Resource Capital AG employed or engaged persons have worked for the preparation of all of the published contents with the greatest possible diligence to guarantee that the used and underlying data as well as facts are complete and accurate and the used estimates and made forecasts are realistic. Therefore, liability is categorically precluded for pecuniary losses which could potentially result from use of the information for one's own investment decision.

All information published in publications of Swiss Resource Capital AG reflects the opinion of the respective author or third parties at the time of preparation of the publication. Neither Swiss Resource Capital AG nor the respective authors can be held responsible for any resulting pecuniary losses. All information is subject to change. Swiss Resource Capital AG as well as the respective authors assures that only sources which are deemed reliable and trustworthy by Swiss Resource Capital AG and the respective authors at the time of preparation are used. Although the assessments and statements in all publications of Swiss Resource Capital AG were prepared with due diligence, neither Swiss Resource Capital AG nor the respective authors take any responsibility or liability for the actuality, correctness, mistakes, accuracy, completeness, adequacy or quality of the presented facts or for omissions or incorrect information. The same shall apply for all presentations, numbers, designs and assessments expressed in interviews and videos.

Swiss Resource Capital AG and the respective authors are not obliged to update information in publications. Swiss Resource Capital AG and the respective authors explicitly point out that changes in the used and underlying data, facts, as well as in the estimates could have an impact on the forecasted share price development or the overall estimate of the discussed security. The statements and opinions of Swiss Capital Resource AG as well as the respective author are not recommendations to buy or sell a security.

Neither by subscription nor by use of any publication of Swiss Resource Capital AG or by expressed recommendations or reproduced opinions in such a

publication will result in an investment advice contract or investment brokerage contract between Swiss Resource Capital AG or the respective author and the subscriber of this publication.

Investments in securities with low liquidity and small market cap are extremely speculative as well as a high risk. Due to the speculative nature of the presented companies their securities or other financial products it is quite possible that investments can lead to a capital reduction or to a total loss and – depending on the investment – to further obligations for example additional payment liabilities. Any investment in warrants, leveraged certificates or other financial products bears an extremely high risk. Due to political, economical or other changes significant stock price losses can arise and in the worst case a total loss of the invested capital and – depending on the investment – to further obligations for example additional payment liabilities. Any liability claim for foreign share recommendations, derivatives and fund recommendations are in principle ruled out by Swiss Resource Capital AG and the respective authors. Between the readers as well as the subscribers and the authors as well as Swiss Resource Capital AG no consultancy agreement is closed by subscription of a publication of Swiss Resource Capital AG because all information contained in such a publication refer to the respective company but not to the investment decision. Publications of Swiss Resource Capital AG are neither, direct or indirect an offer to buy or for the sale of the discussed security (securities), nor an invitation for the purchase or sale of securities in general. An investment decision regarding any security should not be based on any publication of Swiss Resource Capital AG.

Publications of Swiss Resource Capital AG must not, either in whole or in part be used as a base for a binding contract of all kinds or used as reliable in such a context. Swiss Resource Capital AG is not responsible for consequences especially losses, which arise or could arise by the use or the failure of the application of the views and conclusions in the publications. Swiss Resource Capital AG and the respective authors do not guarantee that the expected profits or mentioned share prices will be achieved.

The reader is strongly encouraged to examine all assertions him/herself. An investment, presented by Swiss Resource Capital AG and the respective authors in partly very speculative shares and financial products should not be made without reading the most current balance sheets as well as assets and liabilities reports of the companies at the Securities and Exchange Commission (SEC) under www.sec.gov or other regulatory authorities or carrying out

other company evaluations. Neither Swiss Resource Capital AG nor the respective authors will guarantee that the expected profits or mentioned share prices will be achieved. Neither Swiss Resource Capital AG nor the respective authors are professional investment or financial advisors. The reader should take advice (e. g. from the principle bank or a trusted advisor) before any investment decision. To reduce risk investors should largely diversify their investments.

In addition, Swiss Resource Capital AG welcomes and supports the journalistic principles of conduct and recommendations of the German press council for the economic and financial market reporting and within the scope of its responsibility will look out that these principles and recommendations are respected by employees, authors and editors.

Forward-looking Information

Information and statements in all publications of Swiss Resource Capital AG especially in (translated) press releases that are not historical facts are forward-looking information within the meaning of applicable securities laws. They contain risks and uncertainties but not limited to current expectations of the company concerned, the stock concerned or the respective security as well as intentions, plans and opinions. Forward-looking information can often contain words like “expect”, “believe”, “assume”, “goal”, “plan”, “objective”, “intent”, “estimate”, “can”, “should”, “may” and “will” or the negative forms of these expressions or similar words suggesting future events or expectations, ideas, plans, objectives, intentions or statements of future events or performances. Examples for forward-looking information in all publications of Swiss Resource Capital AG include: production guidelines, estimates of future/targeted production rates as well as plans and timing regarding further exploration, drill and development activities. This forward-looking information is based in part on assumption and factors that can change or turn out to be incorrect and therefore may cause actual results, performances or successes to differ materially from those stated or postulated in such forward-looking statements. Such factors and assumption include but are not limited to: failure of preparation of resource and reserve estimates, grade, ore recovery that differs from the estimates, the success of future exploration and drill programs, the reliability of the drill, sample and analytical data, the assumptions regarding the accuracy of the representativeness of the mineralization, the success of the planned metallurgical test work, the significant deviation of capital and operating costs from the estimates, failure to receive necessary government approval and environmental permits or other project permits, chan-

ges of foreign exchange rates, fluctuations of commodity prices, delays by project developments and other factors.

Potential shareholders and prospective investors should be aware that these statements are subject to known and unknown risks, uncertainties and other factors that could cause actual events to differ materially from those indicated in the forward-looking statements. Such factors include but are not limited to the following: risks regarding the inaccuracy of the mineral reserve and mineral resource estimates, fluctuations of the gold price, risks and dangers in connection with mineral exploration, development and mining, risks regarding the creditworthiness or the financial situation of the supplier, the refineries and other parties that are doing business with the company; the insufficient insurance coverage or the failure to receive insurance coverage to cover these risks and dangers, the relationship with employees; relationships with and the demands from the local communities and the indigenous population; political risks; the availability and rising costs in connection with the mining contributions and workforce; the speculative nature of mineral exploration and development including risks of receiving and maintaining the necessary licences and permits, the decreasing quantities and grades of mineral reserves during mining; the global financial situation, current results of the current exploration activities, changes in the final results of the economic assessments and changes of the project parameter to include unexpected economic factors and other factors, risks of increased capital and operating costs, environmental, security and authority risks, expropriation, the tenure of the company to properties including their ownership, increase in competition in the mining industry for properties, equipment, qualified personal and its costs, risks regarding the uncertainty of the timing of events including the increase of the targeted production rates and fluctuations in foreign exchange rates. The shareholders are cautioned not to place undue reliance on forward-looking information. By its nature, forward-looking information involves numerous assumptions, inherent risks and uncertainties both general and specific that contribute to the possibility that the predictions, forecasts, projections and various future events will not occur. Neither Swiss Resource Capital AG nor the referred to company, referred to stock or referred to security undertake no obligation to update publicly otherwise revise any forward-looking information whether as a result of new information, future events or other such factors which affect this information, except as required by law.

48f Abs. 5 BörseG (Austria) and Art. 620 to 771 obligations law (Switzerland)

Swiss Resource Capital AG as well as the respective authors of all publications of Swiss Resource Capital AG could have been hired and compensated by the respective company or related third party for the preparation, the electronic distribution and publication of the respective publication and for other services. Therefore the possibility exists for a conflict of interests.

At any time Swiss Resource Capital AG as well as the respective authors of all publications of Swiss Resource Capital AG could hold long and short positions in the described securities and options, futures and other derivatives based on theses securities. Furthermore Swiss Resource Capital AG as well as the respective authors of all publications of Swiss Resource Capital AG reserve the right to buy or sell at any time presented securities and options, futures and other derivatives based on theses securities. Therefore the possibility exists for a conflict of interests.

Single statements to financial instruments made by publications of Swiss Resource Capital AG and the respective authors within the scope of the respective offered charts are not trading recommendations and are not equivalent to a financial analysis.

A disclosure of the security holdings of Swiss Resource Capital AG as well as the respective authors and/or compensations of Swiss Resource Capital AG as well as the respective authors by the company or third parties related to the respective publication will be properly declared in the publication or in the appendix.

The share prices of the discussed financial instruments in the respective publications are, if not clarified, the closing prices of the preceding trading day or more recent prices before the respective publication.

It cannot be ruled out that the interviews and estimates published in all publications of Swiss Resource Capital AG were commissioned and paid for by the respective company or related third parties. Swiss Resource Capital AG as well as the respective authors are receiving from the discussed companies and related third parties directly or indirectly expense allowances for the preparation and the electronic distribution of the publication as well as for other services.

Exploitation and distribution rights

Publications of Swiss Resource Capital AG may neither directly or indirectly be transmitted to Great

Britain, Japan, USA or Canada or to an US citizen or a person with place of residence in the USA, Japan, Canada or Great Britain nor brought or distributed in their territory. The publications and their contained information can only be distributed or published in such states where it is legal by applicable law. US citizens are subject to regulation S of the U.S. Securities Act of 1933 and cannot have access. In Great Britain the publications can only be accessible to a person who in terms of the Financial Services Act 1986 is authorized or exempt. If these restrictions are not respected this can be perceived as a violation against the respective state laws of the mentioned countries and possibly of non mentioned countries. Possible resulting legal and liability claims shall be incumbent upon that person, but not Swiss Resource Capital, who has published the publications of Swiss Resource Capital AG in the mentioned countries and regions or has made available the publications of Swiss Resource Capital AG to persons from these countries and regions.

The use of any publication of Swiss Resource Capital AG is intended for private use only. Swiss Resource Capital AG shall be notified in advance or asked for permission if the publications will be used professionally which will be charged.

All information from third parties especially the estimates provided by external user does not reflect the opinion of Swiss Resource Capital AG. Consequently, Swiss Resource Capital AG does not guarantee the actuality, correctness, mistakes, accuracy, completeness, adequacy or quality of the information.

Note to symmetrical information and opinion generation

Swiss Resource Capital AG can not rule out that other market letters, media or research companies are discussing concurrently the shares, companies and financial products which are presented in all publications of Swiss Resource Capital AG. This can lead to symmetrical information and opinion generation during that time period.

No guarantee for share price forecasts

In all critical diligence regarding the compilation and review of the sources used by Swiss Resource Capital AG like SEC Filings, official company news or interview statements of the respective management neither Swiss Resource Capital AG nor the respective authors can guarantee the correctness, accuracy and completeness of the facts presented in the sources. Neither Swiss Resource Capital AG nor the respective authors will guarantee or be liable for that all assumed share price and profit develop-

ments of the respective companies and financial products respectively in all publications of Swiss Resource Capital AG will be achieved.

No guarantee for share price data

No guarantee is given for the accuracy of charts and data to the commodity, currency and stock markets presented in all publications of Swiss Resource Capital AG.

Copyright

The copyrights of the single articles are with the respective author. Reprint and/or commercial dissemination and the entry in commercial databases is only permitted with the explicit approval of the respective author or Swiss Resource Capital AG.

All contents published by Swiss Resource Capital AG or under <http://www.resource-capital.ch> – website and relevant sub-websites or within <http://www.resource-capital.ch> – newsletters and by Swiss Resource Capital AG in other media (e.g. Twitter, Facebook, RSS-Feed) are subject to German, Austrian and Swiss copyright and ancillary copyright. Any use which is not approved by German, Austrian and Swiss copyright and ancillary copyright needs first the written consent of the provider or the respective rights owner. This applies especially for reproduction, processing, translation, saving, processing and reproduction of contents in databases or other electronic media or systems. Contents and rights of third parties are marked as such. The unauthorised reproduction or dissemination of single contents and complete pages is not permitted and punishable. Only copies and downloads for personal, private and non commercial use is permitted.

Links to the website of the provider are always welcome and don't need the approval from the website provider. The presentation of this website in external frames is permitted with authorization only. In case of an infringement regarding copyrights Swiss Resource Capital AG will initiate criminal procedure.

Information from the Federal Financial Supervisory Authority (BaFin)

You can find further information on how to protect yourself against dubious offers in BaFin brochures directly on the website of the authority at www.bafin.de.

Liability limitation for links

The <http://www.resource-capital.ch> – website and all sub-websites and the <http://www.resource-capital.ch> – newsletter and all publications of Swiss Resource Capital AG contain links to websites of third parties (“external links”). These websites are subject to liability of the respective operator. Swiss Resource Capital AG has reviewed the foreign contents at the initial linking with the external links if any statutory violations were present. At that time no statutory violations were evident. Swiss Resource Capital AG has no influence on the current and future design and the contents of the linked websites. The placement of external links does not mean that Swiss Resource Capital AG takes ownership of the contents behind the reference or the link. A constant control of these links is not reasonable for Swiss Resource Capital AG without concrete indication of statutory violations. In case of known statutory violations such links will be immediately deleted from the websites of Swiss Resource Capital AG. If you encounter a website of which the content violates applicable law (in any manner) or the content (topics) insults or discriminates individuals or groups of individuals, please contact us immediately.

In its judgement of May 12th, 1998 the Landgericht (district court) Hamburg has ruled that by placing a link one is responsible for the contents of the linked websites. This can only be prevented by explicit dissociation of this content. For all links on the homepage <http://www.resource-capital.ch> and its sub-websites and in all publications of Swiss Resource Capital AG applies: Swiss Resource Capital AG is dissociating itself explicitly from all contents of all linked websites on <http://www.resource-capital.ch> – website and its sub-websites and in the <http://www.resource-capital.ch> – newsletter as well as all publications of Swiss Resource Capital AG and will not take ownership of these contents.”

Liability limitation for contents of this website

The contents of the website <http://www.resource-capital.ch> and its sub-websites are compiled with utmost diligence. Swiss Resource Capital AG however does not guarantee the accuracy, completeness and actuality of the provided contents. The use of the contents of website <http://www.resource-capital.ch> and its sub-websites is at the user's risk. Specially marked articles reflect the opinion of the respective author but not always the opinion of Swiss Resource Capital AG.

Liability limitation for availability of website

Swiss Resource Capital AG will endeavour to offer the service as uninterrupted as possible. Even with due care downtimes can not be excluded. Swiss Resource Capital AG reserves the right to change or discontinue its service any time.

Liability limitation for advertisements

The respective author and the advertiser are exclusively responsible for the content of advertisements in <http://www.resource-capital.ch> – website and its sub-websites or in the <http://www.resource-capital.ch> – newsletter as well as in all publications of Swiss Resource Capital AG and also for the content of the advertised website and the advertised products and services. The presentation of the advertisement does not constitute the acceptance by Swiss Resource Capital AG.

No contractual relationship

Use of the website <http://www.resource-capital.ch> and its sub-websites and <http://www.resource-capital.ch> – newsletter as well as in all publications of Swiss Resource Capital AG no contractual relationship is entered between the user and Swiss Resource Capital AG. In this respect there are no contractual or quasi-contractual claims against Swiss Resource Capital AG.

Protection of personal data

The personalized data (e.g. mail address of contact) will only be used by Swiss Resource Capital AG or from the respective company for news and information transmission in general or used for the respective company.

Data protection

If within the internet there exists the possibility for entry of personal or business data (email addresses, names, addresses), this data will be disclosed only if the user explicitly volunteers. The use and payment for all offered services is permitted – if technical possible and reasonable – without disclosure of these data or by entry of anonymized data or pseudonyms. Swiss Resource Capital AG points out that the data transmission in the internet (e.g. communication by email) can have security breaches. A complete data protection from unauthorized third party access is not possible. Accordingly no liability is assumed for the unintentional transmission of data. The use of contact data like postal addresses, tele-

phone and fax numbers as well as email addresses published in the imprint or similar information by third parties for transmission of not explicitly requested information is not permitted. Legal action against the senders of spam mails are expressly reserved by infringement of this prohibition.

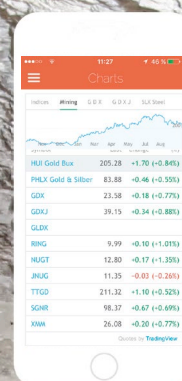
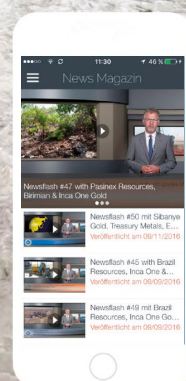
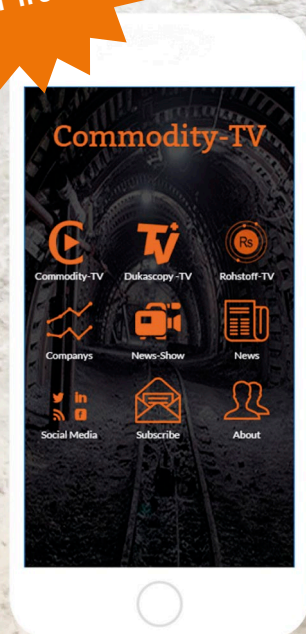
By registering in <http://www.resource-capital.ch> – website and its sub-websites or in the <http://www.resource-capital.ch> – newsletter you give us permission to contact you by email. Swiss Resource Capital AG receives and stores automatically via server logs information from your browser including cookie information, IP address and the accessed websites. Reading and accepting our terms of use and privacy statement are a prerequisite for permission to read, use and interact with our website(s).



Commodity-TV

The whole world of commodities in one App!

Download
our unique App
for free!



Watch Management & Expert Interviews, Site-Visit-Videos,
News Shows and receive top and up to date
Mining Information on your mobile device worldwide!

Amazing features:

- Company Facts
- Global Mining News
- Push Notifications
- Commodity-TV, Rohstoff-TV and Dukascopy-TV
- Live Charts
- JRB-Rohstoffblog

powered by:



Table of Contents

Disclaimer	02
Table of Contents Imprint	07
Preface	09
The electric boom begins! - Lithium, cobalt, nickel and vanadium start a new era!	10
Interview with Tobias Tretter – Manager of the Structured Solutions Next Generation Resources Fund	27
Firmenprofile	
Defense Metals.....	32
Giga Metals.....	36
Lithium Chile.....	40
Mali Lithium.....	44
Millennial Lithium.....	48
Neolithium	52
Plateau Energy Metals	56

Imprint

Editor
Swiss Resource Capital AG
Poststr. 1
9100 Herisau, Schweiz
Tel : +41 71 354 8501
Fax : +41 71 560 4271
info@resource-capital.ch
www.resource-capital.ch

Editorial staff
Jochen Staiger
Tim Rödel

Layout/Design
Frauke Deutsch

All rights reserved. Reprinting
material by copying in electronic
form is not permitted.
Editorial Deadline: 10/01/2019

Cover: sungsu han/shutterstock.com
page 12: @ser_igor/stock.adobe.com
Back:

1: pittoresqueemi, Pixabay
2: Walkema, gemeinfrei
3: F. Muhammad, Pixabay
4: A. Krebs, Pixabay

All images and graphics are, unless
otherwise stated, by the companies.

Charts: 10/17/2019
JS Charts by amCharts



**Commodity-TV and Rohstoff-TV get
your company the awareness it deserves!**



Preface

Dear Readers,

With pride and joy we are already entering the fourth year of publication of our Battery Metals Report.

Our special report series started with lithium because we see this metal, as well as cobalt, vanadium and nickel, as one of the great energy future metals and see great opportunities and potential in the long term despite the boom that has already taken place. The battery developments have made enormous progress in the last two years and also cost-technically one has become clearly more favorable. The ranges increase and thus also the acceptance of the end customers, i.e. car buyers. You can see not only Teslas but also many Zoes, Nexos, Toyotas plus the E-Tron from Audi and the EQC from Mercedes. Volkswagen is now putting a whole army of e-mobiles on the roads, which also look very good. The electric car is increasingly conquering its place among consumers and in automotive history. At the end of 2018, 5.1 million electricians were on the move worldwide. By the end of 2019 we will probably already have 8.5 million electric cars and by the end of 2020 forecasts are already at +12 million. Lithium and cobalt are the main components of all batteries and rechargeable batteries available in large series and thus the main link of the electric vehicle dream. A boom of at least the same magnitude will be experienced in the coming years by decentralised storage facilities, which will be able to help to achieve the base-load capacity of wind power and photovoltaic systems that has been lacking up to now. This in turn requires larger quantities of vanadium.

The IAA just took place in Frankfurt, where 15,000 demonstrators against the car cavored, but more than 60,000 visitors found their way into the halls to gather information. Even though many a do-gooder has fought against the car, a car is still indispensable for commuters, commercial travellers and people who are active in business, not to mention personal freedom. Contrary to the notorious black-eyed and paranoid market criers who prefer to abolish the German car industry, it is increasingly possible to find a consensus for tomorrow's mobility that does not even endanger 4 million jobs in the car industry and thus Ger-

many as a whole. 2019 is the starting year for electric vehicles on a grand scale worldwide, as all well-known manufacturers - above all the Germans - are launching more than 60 new electric models on the market. Away from the concept car and the study towards mass production and day-to-day e-automobiles. I just read in AutoMotorSport that Porsche and its battery partners are already working on a battery that could have a range of 1,000 kilometres. That would be a huge breakthrough. All these will be enormous drivers of the demand for lithium, cobalt, nickel and vanadium but above all copper. In general, copper is currently being played as a recession barometer on the futures exchanges. However, according to the German government, another 30,000 loading points are to be added by 2030. This means millions of tons of copper which are not only used for cars, but mainly for the charging infrastructure. 2020 should not only be the beginning of a new decade, but it looks like a decade for raw materials, as these are and will remain the basis of our economic activities.

Swiss Resource Capital AG has set itself the task of providing commodity investors, interested parties and those who would like to become investors with up-to-date and comprehensive information on a wide variety of commodities and mining companies. On our website www.resource-capital.ch you will find more than 24 companies and lots of information and articles about raw materials.

We would like to give you the necessary insights through our special reports and provide you with comprehensive information. Additionally our two raw material IPTV channels www.Commodity-TV.net & www.Rohstoff-TV.net are available to you free of charge at any time. If you are on the go, we recommend our new Commodity TV App for iPhone and Android, which provides you with real-time charts, prices and the latest videos.

My team and I hope you enjoy reading the Battery Metals Special Reports 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 Roedel is chief-editorial- and chief-communications-manager at SRC AG. He has been active in the commodity sector since 2007 and held several editor- and chief-editor-positions, e.g. at the publications Rohstoff-Spiegel, Rohstoff-Woche, Rohstoffraketen, Wahrer Wohlstand and First Mover. He owns an enormous commodity expertise and a wide-spread network within the whole resource sector.

The electric boom begins! – Lithium, cobalt, nickel and vanadium start a new era!

The combustion engine will disappear sooner or later – the third decade of the 21st century will be the breakthrough for electric propulsion.

The leap from the age of fossil combustion and the most immediate consumption possible to the decentralisation of energy production, the corresponding need for on-site storage and, ultimately, to a true revolution in mobility has begun, and the electric boom will not only really take off in automotive construction from 2020. After more than 100 years of combustion engines, the next stage of development is finally being ignited, and that is called „electro mobility“. Even if this transformation will entail job losses: There's no stopping it now.

Musk makes it possible - or how a South African breaks the omnipotence of the oil multinationals

Even though China has long set the tone, the electro-revolutionary movement is primarily due to one name: Elon Musk! The eccentric South African, who was bullied as a child and beaten to unconsciousness and first made headlines with the invention and sale of the PayPal payment system to eBay, had a vision of a purely electric locomotive at the beginning of the 21st century and founded Tesla Motors in 2004. This triggered a real chain reaction that led many states, companies and private individuals to clearly opt for the electric motor as their future drive and energy storage system. Although Musk did not invent the electric motor, he will always be recorded in history books as the one who broke the omnipotence of the oil multinationals and ushered in a new era of locomotion.

Electric mobility is picking up speed!

Many countries are now fully committed to the electro-mobility card

Above all, many countries have now jumped on the electric mobility bandwagon in order to achieve the climate targets they have set themselves, and have introduced measures that will further accelerate the process of turning away from the internal combustion engine and at the same time towards the electric motor.

The following goals have already been clearly formulated:

- ▶ **Canada:** 30% of electric vehicles sold by 2030 - Quebec Province wants emissions reduced to zero by 2050
- ▶ **USA:** 10 states want to reduce emissions to zero by 2050, including the New England states of Connecticut, New Hampshire, Maine, Massachusetts, Rhode Island and Vermont as well as New York, California and Oregon.
- ▶ **Mexico:** 30% electric vehicles sold by 2030
- ▶ **Brazil:** 30% electric vehicles sold by 2030
- ▶ **Great Britain:** End of combustion sales by 2040
- ▶ **France:** End of combustion sales by 2040
- ▶ **Ireland:** End of combustion sales by 2030
- ▶ **Norway:** End of combustion sales by 2035
- ▶ **Netherlands:** End of combustion sales by 2035
- ▶ **Sweden:** End of combustion sales by 2035 - 30% electric vehicles sold by 2030
- ▶ **Germany:** End of combustion sales by 2030

- ▶ **Italy:** 30% electric vehicles sold until 2030
- ▶ **EU:** 30% electric vehicles sold until 2030
- ▶ **Israel:** End of combustion sales by 2030
- ▶ **India:** End of combustion sales by 2030
- ▶ **Japan:** 30% electric vehicles sold by 2030
- ▶ **South Korea:** 30% electric vehicles sold by 2030
- ▶ **China:** 5% electric vehicles sold by 2020, 20% electric vehicles sold by 2025

Car manufacturers plan to build many millions of electric vehicles

These planned measures put the car manufacturers under pressure, so that they have already reacted and have spent the following company goals:

- ▶ **BMW:** By 2025, 15 to 25% of all vehicles produced are to be powered purely by electricity, which is equivalent to a total of around 300,000 to 600,000 vehicles;
- ▶ **Chevrolet:** After 30,000 electric vehicles sold in 2017, no concrete targets defined yet;
- ▶ The **Chinese carmakers**, which now number more than 170, want to put at least 4.5 million electric vehicles on the roads by 2020;
- ▶ **Daimler:** Ten new electric models by 2022. By 2025, 15 to 25% of all vehicles produced will be powered purely by electricity, which will account for a total of about 300,000 to 600,000 vehicles;
- ▶ **Ford:** By 2020, at least 13 models are to be powered electrically, which is about 10 to 25% of the entire model range;
- ▶ **General Motors:** 20 new electric models by 2023 and complete switch to electric mobility - period still open;
- ▶ **Honda:** In 2030, two thirds of all mo-

dels are to run with an electric motor - according to today's figures about 3.3 million;

- ▶ **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 2020;
- ▶ **Tesla:** 1 million vehicles from 2020;
- ▶ **Toyota:** 50% conversion to electric drive and hybrid by 2030;
- ▶ **Volvo:** 100% conversion to electric and hybrid drive by 2019 (500,000 vehicles);
- ▶ **VW Group:** By 2025, 20 to 25% of all vehicles produced are to be powered purely by electricity, which is equivalent to a total of around 2 to 3 million vehicles. By 2030, 300 electric models are to be launched on the market.

In total, the leading car manufacturers plan to produce more than 20 million electric vehicles per year from 2025 alone. From 2030, 25 million electrically powered vehicles per year are expected, from 2040 even 60 million vehicles per year. Daimler alone plans to invest over 80 billion euros in electric mobility in the coming years. Bloomberg expects that by 2040 at the latest every second new vehicle will be equipped with an electric drive.

There is currently no way around the lithium-ion battery

The heart of every electric vehicle is not only the motor but also the energy storage device, i.e. a rechargeable battery. In order to be operated economically in the long term, electric vehicles, but also increasingly emerging decentralised storage systems - such as for photovoltaic or wind power plants - require ever more powerful batteries. In the meantime, the lithium-ion battery has emerged as a

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):**

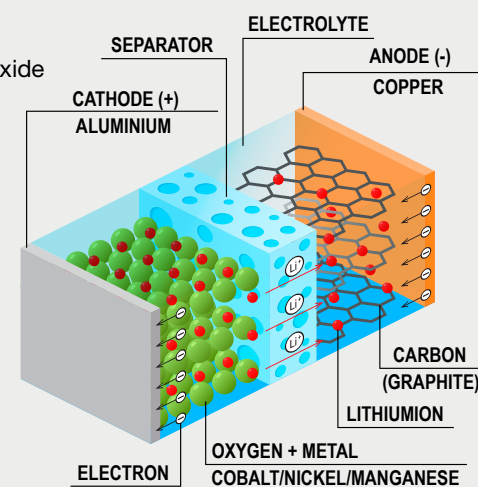
Lithium-Cobalt(III)-oxide
Lithium-Nickel-Manganese-Cobalt-Oxide
Oxygen
Aluminum as conductor material

► **Negative electrode (anode):**

Graphite or related carbon materials
Silicon
Tin dioxide
Copper as conductor material

► **Electrolyte (solution)**

► **Separator of polymer membrane**



Operating principle of a lithium-ion accumulator

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 via the external 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.

clear favourite. One of the reasons for this is that the voltage within a lithium-ion battery is reached by exchanging lithium ions. Due to their high energy density, lithium-ion batteries deliver constant performance over the entire discharge period and have no so-called memory effect, i.e. a successive loss of capacity over many years of use or frequent partial discharge. The name „lithium ion battery“ is only the generic term for a whole series 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-sulfur lithium ion battery.

Decentralised storage will clearly dominate the market in the future

Vanadium redox batteries are better suited for use in the field of regenerative energies.

The use of lithium, cobalt and nickel in lithium-ion batteries or rechargeable batteries of the same name in automotive engineering is one side of the coin. Correspondingly larger energy storage facilities are being used more and more for storing electricity from alternative energy sources. The virtually explosive expansion of energy generation from wind farms or solar cells is a huge step forward in terms of environmental protection, but an enormous challenge for the electricity grids. This is because renewable energy sources often exhibit extreme fluctuations in power generation. When the wind is blowing or the sun is shining, large amounts of Electricity „pumped“ into the grid. In the short term, enormous overcapacities of electricity arise, some of which are not needed at all. According to calculations, up to 20 percent of the annual yield of a

wind farm is already lost today because the turbines have to be shut down at short notice due to grid overload. This can be remedied by storage facilities that initially absorb the excess energy and later release it back into the grid when needed, i.e. when there is a threat of undersupply. The vanadium redox accumulator plays a decisive role in this process.

Vanadium redox battery - Higher operational reliability than lithium-ion battery, but not suitable for electric vehicles

The vanadium redox accumulator is a so-called flux accumulator which uses vanadium compounds in aqueous solutions in both electrolytes. Vanadium redox flow cells offer a very high operational reliability compared to other storage systems (especially lithium-ion accumulators), as the electrolyte is neither flammable nor explosive due to its high water content. The commercial batteries currently available are used exclusively in stationary applications, such as regenerative energy sources for peak load coverage and load balancing, and uninterruptible power supplies. By the end of 2018, more than 60 large vanadium redox flow batteries were in operation worldwide. The largest vanadium redox flow battery in Germany with a capacity of 2 megawatts and 20 MWh energy storage capacity was completed in September 2019 in Baden-Württemberg. The largest battery in the world will also be a vanadium redox flow battery. This is to generate 200 megawatts in northeastern China and store 800 MWh of energy.

The vanadium redox accumulator, on the other hand, is not an option for powerful electric cars because the volumetric energy density of the battery is far too small, i.e. the battery takes up too much space.

The largest application for vanadium redox batteries in the future: decentralized energy storage

So-called smart grid systems require a large number of short- and medium-term energy storage devices that absorb too much generated energy and can later release it back into the grid when wind and sun are absent. Vanadium redox batteries can clearly remedy this by storing too much energy temporarily and only releasing it back into the grid when required. Many manufacturers are already trying their hand at efficient vanadium redox batteries, which are primarily intended for decentralised use, such as directly in the household of a family with a photovoltaic system on the roof or near wind farms.

Asians dominate the battery sector

North America is Tesla country ...

Outside Asia, North America in particular has taken the dominant position in lithium-ion battery production. Tesla Motors has a lot to say about this. The company is currently building its 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 have been built there. The factory will be completed by 2020. The „Gigafactory 2“ is a photovoltaic factory located in Buffalo, New York. The „Gigafactory 3“ is to be built in China near Shanghai and will produce the same quantity of vehicles as the plant in Nevada.

... the EU is still in its infancy ...

The big car manufacturers of the EU seem to have overslept the electric revo-

lution, at least with regard to their own battery production. Several initiatives by Germany alone, together with France and the EU itself, have so far failed to deliver the big hit. The furthest is currently the Swedish Northvolt, which plans to build a Gigafactory in Skellefteå in northern Sweden, some 700 kilometres from the capital Stockholm. Initially, an annual cell production of around eight gigawatt hours (GWh) is to be achieved, followed by 32 GWh from 2023. This could equip around 650,000 cars with a 50-kilowatt hour battery. VW recently announced that it would enter the project with 20%. The carmaker is investing around 900 million euros in this project. Daimler is already one step ahead, already operates a plant in Saxony and plans to invest 20 billion euros in a battery cell production network by 2030. The partners come mainly from Asia.

... but the music is made in Asia!

China alone already accounts for about one third of total demand for lithium-ion batteries. According to expert estimates, this will remain the case for the time being, as China still has by far the largest output of rechargeable batteries and accumulators. This stimulates the country's immense consumption of lithium and cobalt. It is also expected that China will continue to see the strongest annual increase in lithium and cobalt demand of all major market players over the next 5 to 10 years, mainly due to the expected multiplication of the number of rechargeable batteries. Other major suppliers of lithium-ion batteries, including South Korea and Japan, are also expected to guarantee a robust increase in lithium and cobalt demand. The electronic giants Panasonic, Samsung, LG Chem, BYD, Boston Power, Lishen, CATL, Dynavolt and Great Wall are to be mentioned above all here.

More Gigafactories are already in the making

Tesla is by far not the only lithium and cobalt consumer planning to produce more lithium-ion batteries. LG Chem already started production for Chevy in Michigan in October 2015. Furthermore, Foxconn, BYD (the world's largest producer of rechargeable batteries, especially for mobile phones), Lishen, CATL and Boston Power are working on the construction of their own Gigafactories, also for so-called Power Banks, i.e. decentralized power storage units. Outside Asia and North America there are currently only a few serious players to be found. Worth mentioning are Northvolt from Sweden and Terra E Holding from Ger-

many, each of which is aiming for a production capacity similar to Tesla.

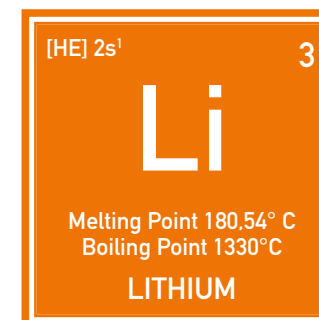
Lithium-ion batteries are the latest state of the art and market leaders

In addition to the aforementioned raw materials lithium, cobalt, nickel and manganese, a lithium-ion battery essentially consists of aluminum, copper, graphite, zinc, tin, silver and steel. The majority of (lithium-ion) batteries currently on the market are lithium-cobalt (dioxide) batteries, which is why this report deals primarily with the „battery metals“ lithium, nickel and cobalt plus vanadium.

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, silver white by nature and relatively soft. Lithium is highly reactive, which is why it always occurs in nature as a lithium compound. It starts up rapidly in the air, which is 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 production is either tedious or expensive

Worldwide lithium production is divided into several different branches that produce 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 and for the production of aluminium-lithium alloys.

The industry essentially distinguishes 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%, especially for high-end cathode materials in batteries and accumulators.

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

New Processing Processes and Lithium Sources Could Revolutionize Production

Recently, more and more exploration and development companies have been relying on new technologies to help them

extract lithium from brine deposits within days and even hours, rather than by means of natural evaporation, using specially developed processes in corresponding plants. The processes of Tenova Bateman and IBC Advanced Technologies should be mentioned here.

In addition, a third lithium source was identified by several lithium development companies. This makes it possible 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 seemingly unusual lithium recovery also seems to be economically feasible. This means that brine-containing (former) oil fields will also become a focus of the lithium industry.

Larger lithium deposits concentrated in a few regions

Lithium accounts for about 0.006 % of the earth's crust and is therefore somewhat less abundant than zinc, copper and tungsten and somewhat more abundant than cobalt, tin and lead. Estimates by the US Geological Survey assume that around 40 million tonnes of lithium can be extracted as reserves worldwide. About 67% of them in the South American countries Chile and Argentina alone. The largest lithium carbonate production currently takes place in Salar de Atacama, a salt lake in the northern Chilean province of Antofagasta. Around 61 percent of global lithium production, however, comes from Australia, albeit at much higher costs than in South America. In addition, there are significant lithium deposits mainly in North America and China.

Lithium production is currently concentrated mainly in four countries and a few companies

Australia, Chile, China and Argentina currently account for around 96 percent of

the world's total lithium production, and only a few companies share them among themselves. As a result, the entire lithium market is very non-transparent, which is why the large battery and rechargeable battery 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 offer oligopoly, lithium is currently also not traded on the stock exchange, the actual trading prices are strictly confidential.

One reason for this, which is always mentioned by the few suppliers, is that the available and required lithium qualities are too different for a standardized stock exchange.

Main fields of application are alloys, lubricants and rechargeable batteries.

Its above-mentioned special and versatile properties make lithium a sought-after material in many different applications. So, it should come as no surprise that the main field of application for lithium has constantly changed in the past. Initially mainly used in medicine, the element began its triumphal march 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. This picture has changed once again in the past 20 years. In the course of the beginning electrical revolution one recognized quite fast that it is suitable due to its low normal potential almost perfectly as an anode in batteries. Lithium batteries are characterized by a very high energy density and can generate particularly high voltages. Lithium batteries are not rechargeable. Lithium-ion accumulators, on the other hand, have this property, in which lithium metal oxides such as lithium cobalt oxide are connected as cathode. As a raw material for the production of rechargeable batte-

ries, however, higher purity grades than 99.5% are required. Lithium hydroxide is used in the „Industrial“ quality as a raw material for lubricants and coolants, among other things; with the higher „Technical“ quality grade, it is also used in accumulator and battery production. Lithium carbonate - crystalline, granulated or powdered - is used, for example, in the electrolytic production of aluminium, in the ceramic and pharmaceutical industries and in alloying technology. Special grades of purity of lithium carbonate in the form of very fine powder (battery grade powder) are suitable as raw materials for the production of lithium ion batteries. The extraction and processing of (especially high-grade) lithium is considered to be very costly.

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

A large quantity of lithium is required for the production or operation of lithium-ion batteries. Every smartphone, for example, contains between 5 and 7 grams of LCE (lithium carbonate equivalent). With a notebook or tablet it is already 20 to 45 grams. Electric 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 around 23 kilograms of LCE, while batteries for electric cars require between 40 and 80 kilograms. An energy store with 650 MWh capacity needs about 1.5 tons of LCE. With quantities in the billions (smartphone) or in the millions (notebook, tools, cars, e-bikes, etc.), several 100,000 tons of LCE demand per year quickly accumulate.

Lithium production will (and must) increase sharply

In 2015, global lithium production amounted to around 175,000 metric tons of LCE. Projections assume that this fi-

Lithium carbonate price
(Source: own representation)

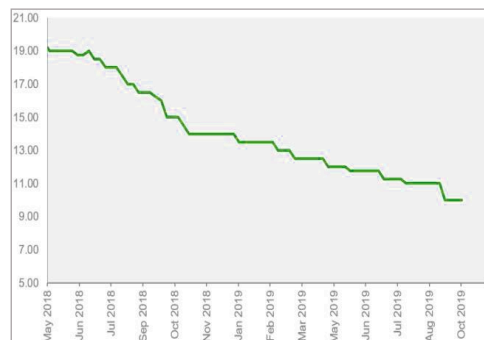


figure could rise to around 330,000 tonnes of LCE by 2020, although no concrete mine extensions or new mines have yet been identified for the time being, so that lithium is likely to run into a huge supply deficit.

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

Ultimately, it is the price alone that decides whether the existing lithium deposits are economically viable. And this has picked up strongly in recent months. While in mid-2015 the price was still around US\$ 6,000 per tonne of lithium carbonate, since then it has peaked at over US\$ 20,500. Certainly, just a snapshot. It can be assumed that in the medium to long term this will settle at between US\$ 10,000 and US\$ 12,000 per tonne of lithium carbonate. One way or another a

lucrative business for the producers, the pure production costs for the current projects are only around 1,800 (Chile) to 6,700 (China) US\$ per ton. This is similarly the case with lithium hydroxide. Since lithium makes up a considerable part of a battery in terms of quantity, but is only responsible for around 4-5% of the cost of a battery, the price of lithium is ultimately relatively insignificant for the production of lithium-ion batteries and should therefore be kept at an economic level for lithium producers.

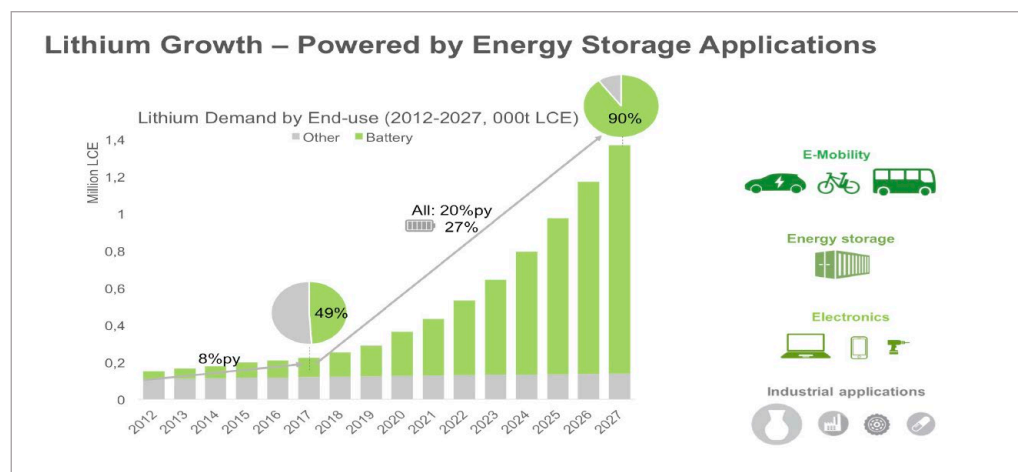
Development companies are working intensively on new projects, ...

While the big names Albemarle, SQM, Livent (formerly FMC) and Tianqi have plans to expand their production, but at the same time have no great interest in falling lithium prices, numerous development companies are working on advancing new lithium projects and identifying concrete deposits and resources.

... partly in new lithium hot spots

In addition to the classic lithium regions of South America and Australia, more and more North America is emerging as a lithium hot spot, especially Canada, Mexico and (due to its proximity to the

(Source: Infinity Lithium Corporation/Roskill)



future top consumer Tesla Motors) the USA. Another important lithium hot spot is located in northwest Argentina, where Orocobre operates the Olaroz lithium mine. There and in neighbouring Chile there are also a number of development companies that have already reported several top-class results, such as Millennial Lithium.

Conclusion: The demand for lithium is rising rapidly!

The demand for lithium appears almost gigantic not only because of, but above

all 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 2017 there was already 220,000 tonnes of LCE in demand per year. Experts expect LCE demand to rise to over 900,000 tonnes per year by 2025. The main driving factor will be demand from the battery and accumulator sector and the associated automotive industry. While in 2015 only about 40% of lithium demand came from the battery and accumulator sector (60% of demand came from other sectors), its share is expected to rise to over 85% by 2025.

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. Its chemical behavior is similar to that of iron and nickel, and it is resistant to air passivation; it is only dissolved by oxidizing acids.



present is converted into iron oxide by roasting and slagged with silicon dioxide as iron silicate. The result is the so-called rough stone, which in addition to cobalt also contains nickel, copper and other iron as sulphide or arsenide. Further roasting with sodium carbonate and sodium nitrate removes further sulphur. Sulfates and arsenates are formed from part 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 dissolve. With chlorinated lime, cobalt can then be selectively precipitated as cobalt hydroxide and thus separated. This is converted into Co₃O₄ by heating and then reduced to cobalt with coke or aluminium powder.

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 iron sulphide

The majority of cobalt deposits lie beneath the seabed.

Cobalt is a rare element with a frequency in the earth's crust of 0.004 percent. This puts it thirtieth in the list of elements ordered by frequency. Cobalt can be found

in many minerals but is usually only found in small amounts. The element is always associated with nickel, often also with copper, silver, iron or uranium. The world's known cobalt reserves are around 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 tons of cobalt are believed to be present in the earth's crust on the soils of the Atlantic, Pacific and Indian Oceans.

So far, cobalt has mainly been produced in politically unstable regions.

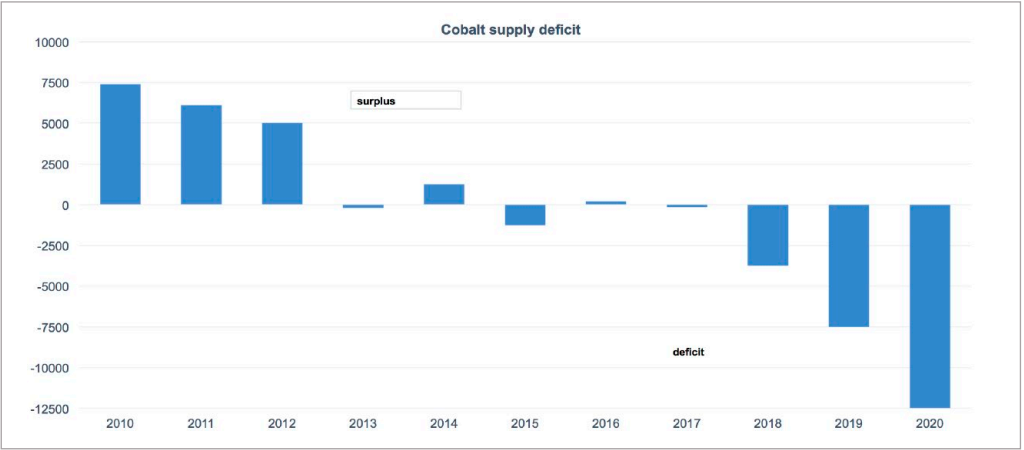
The majority of the annual cobalt supply comes from mines in the Democratic Republic of Congo. About 55% of the total production volume comes from the Central African civil war country. Followed by China with 6.3%. Russia accounted for a further 5%, Zambia for 3.7%, Cuba for 3.4% and the Philippines and Madagascar for almost 3% each. These are all countries that are regarded as rather unstable or at least not necessarily inspiring confidence. The remaining production is divided between Canada (just under 6%), Australia (4.15%), South Africa (2.45%) and several other countries with even lower production volumes. The future security of supply appears to be extremely critical on the basis of the

current producers, which is why there have recently been more and more attempts to develop new mines in Canada, Australia and the USA and to increase production accordingly.

Main fields of application are paints, alloys, medicine, magnets and rechargeable batteries.

In history, cobalt was used in the form of oxides, sulfates, hydroxides or carbonates for heat-resistant paints and pigments. The best-known decorative application is blue cobalt glass. Today cobalt is mainly used as an alloying component to increase the hot strength of alloyed and high-alloy steels, especially high-speed steels and super alloys, as a binder phase in hard metals and diamond tools, as a component of magnetic alloys, as a dryer for paints and varnishes, as a catalyst for desulphurisation and hydrogenation, as a hydroxide or lithium cobalt dioxide (LiCoO₂) in batteries, in corrosion- and wear-resistant alloys and as a trace element for medicine and agriculture. In addition, cobalt is used in the production of magnetic media such as tape and video cassettes, where it improves the magnetic properties by doping. Since the 1990s, cobalt has been used as an anode material in the anode of lithium-ion batteries.

Cobalt supply deficit
(Source: M2Cobalt /own representation)



Not only Electric Vehicles need a lot of cobalt

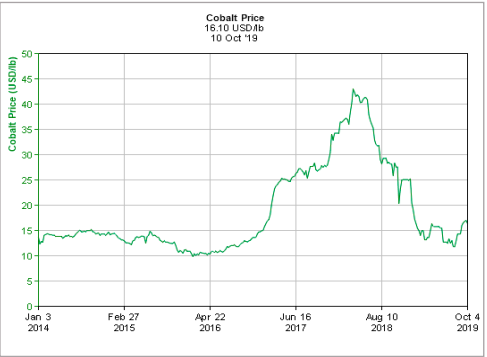
Similar to lithium, cobalt is also consumed in corresponding batteries. Depending on the version, between 5 and 10 grams of cobalt flow into a single smartphone. With a notebook or tablet it is already 30 to 100 grams. Power tools need about 50 grams for their batteries. A 10 KWh storage unit for domestic use (such as Teslas Powerwall) requires about 7 kilograms of cobalt, while the batteries for hybrid vehicles require about 4 kilograms and for purely electric cars 10 kilograms of cobalt. Teslas Model S even reaches 22.5 kilograms. A passenger plane devours about 4,000 kilograms of cobalt. With quantities in the billions (smartphone) or millions (notebook, tools, cars, e-bikes, etc.), several 100,000 tons of cobalt are quickly required per year.

The cobalt supply must be increased

And this is also urgently necessary, because the lithium-ion battery sector will demand ever larger quantities of cobalt in the coming years. While annual production in 2016 was still around 123,000 tonnes, leading experts assume that this production will be difficult to expand at present. The fact is, however, that Congo will remain the absolute world market leader for the time being and will expand its market share to as much as 70% by 2021. The world's two largest mines, Kamoto and Kolwezi, will play a major role in this, producing about 50,000 tons of cobalt per year alone. Outside the Congo, although several companies are working to expand their existing mines (including Glencore, Norilsk, Umicore, Sumitomo and Vale), these mine expansions are likely to be only a drop in the ocean due to the expected increase in demand.

Cobalt price explodes!

Many market participants have already realised that cobalt production cannot be expanded so easily from now on, which is why the cobalt price has exploded from around US\$ 10 to just over US\$ 40 since mid-2016 and is currently around US\$ 16 per pound. However, the all-time high of US\$ 52 from 2008 has not yet been reached, which is only a matter of time given the threat of a massive supply deficit.



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

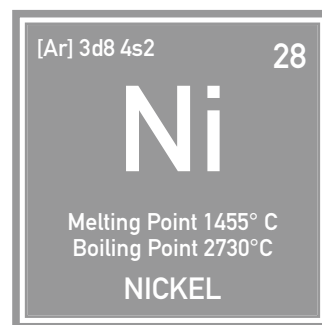
Conclusion: Cobalt will experience an immense surge in demand and a supply deficit in the coming years!

The demand for cobalt should explode in the coming years! While this was still around 60,000 tonnes in 2008, by 2017 the demand had already reached 125,000 tonnes per year. Experts expect demand for cobalt to rise to over 300,000 tonnes per year by 2025. The main driving factor will be demand from the battery and rechargeable battery sector. Due to the current situation that demand is rising sharply, but at the same time only a few existing mines have any possibility at all to increase their production, there are signs of a significant supply deficit for cobalt in the coming years. Already from the current year 2019, a supply deficit seems unavoidable, which will gradually widen in the coming years and will exceed the 10,000 tons per year mark as early as 2020.

Nickel

The Element Nickel

Nickel is a metallic, silvery-shining transition metal. It is medium hard, forgeable and easy to polish. Nickel, like cobalt, is ferromagnetic and also very resistant to air, water, hydrochloric acid and alkalis at room temperature, making it ideal for use in lithium-ion batteries.



Extraction

The majority of nickel is extracted from iron ores containing nickel and copper. By means of a multi-layer process, copper-nickel fine stone, which consists of about 80 % copper and nickel and about 20 % sulphur, is produced. The nickel must be separated from the copper to obtain the crude nickel. In order to obtain pure nickel, the raw nickel is refined electrolytically. The purity of electrolyte nickel is around 99.9 %.

Deposits and Production

Nickel occurs in the earth's crust with a content of about 0.008 %, i.e. about twice the amount of cobalt and somewhat more frequently than lithium. Solid, i.e. nickel is rarely found in elementary form. By 2018, only about 50 sites worldwide were known to contain dignified nickel. 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 classical sulphidic deposits, mining is increasingly shifting to lateritic nickel ores, which, however, means more complex extraction.

Main applications: steels and nickel alloys

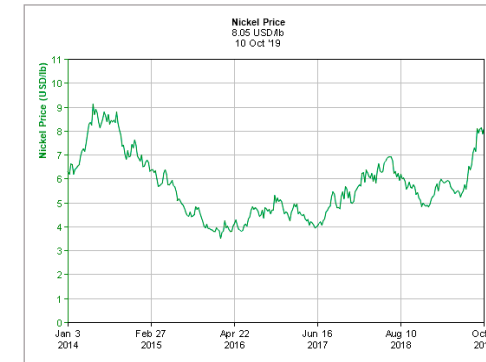
The majority of the annual nickel production (about 85%) is used for the production of stainless steels and nickel alloys. Nickel is one of the most important alloying metals used mainly for steel refining. It makes steel resistant to corrosion and increases its hardness, toughness and ductility. High-alloy nickel steels are used in particularly corrosive environments. About 20% of the nickel extracted is used to produce nickel alloys such as constantane, 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. Because of its chemical resistance, nickel is used for apparatus in chemical laboratories and the chemical industry, such as nickel crucibles for digestions. Nickel alloys, e.g. for coins, are made of 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.

Nickel for accumulators and batteries

Class 1 nickel, with a purity of at least 99.98%, is required for batteries and accumulators. Only about 45% of the total



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

nickel production of about 2 million per year is suitable for the production of Class 1 nickel. More than half of this is required for alloys and other applications. Less valuable Class 2 nickel is used exclusively in steel production.

Development from cobalt to nickel dominated batteries

Due to the fact that the development of lithium-ion batteries is increasingly moving from cobalt to nickel-dominated cathode materials, it can be assumed that an already existing supply deficit will wi-

den in the coming years. This has already been the case for the entire nickel market since 2016. For class 1 nickel, such a supply deficit is expected from 2023 at the latest, with a strong upward trend. For 2030 it can be assumed that 825,000 tons of nickel will be missing. In 2040, the supply deficit is likely to increase to 2 million metric tons per year - including new nickel projects, of course.

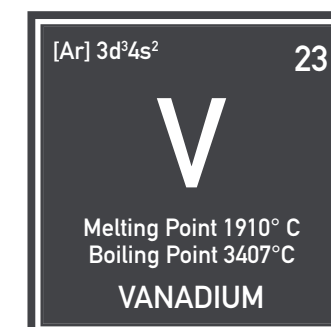
Conclusion: Supply deficit inevitable, first signs already noticeable

A foretaste of what may yet come is already being provided by the LME inventories, which in the past 24 months alone have quartered to around 100,000 tonnes. From 1 to 15 October 2019, stocks plummeted from 150,000 to 100,000 tonnes. The price of nickel itself has risen by around 60% since the beginning of 2019 alone, to around US\$8 per pound, but is still far from its highs of over US\$20. All in all, it looks as if nickel and corresponding producers or developers will be the next big beneficiaries of the electro(mobility) boom!

Vanadium

The Element Vanadium

Vanadium is a steel-grey, bluish shimmering transition metal which is very soft when pure. Although pure vanadium is relatively soft, it becomes harder through the addition of other elements and then has a high mechanical strength. The majority of vanadium is therefore used as ferrovanadium in steel production. The addition of vanadium to chromium-vanadium steels leads to an increase in toughness and thus to an increased resistance of the steel.



Extraction is simple

Although the extraction of vanadium involves many intermediate steps, it has been tried and tested over decades and

is therefore now quite simple. In order to obtain pure vanadium, expensive calcium or aluminium is used as a reducing agent, otherwise high purity cannot be achieved. Whereas pure vanadium is obtained directly with calcium, a vanadium-aluminium alloy is first formed with aluminium, from which pure vanadium is obtained in a vacuum. However, the majority of vanadium is not processed as a pure metal but in the form of the iron-vanadium alloy ferrovanadium, which contains at least 50% vanadium. To produce ferrovanadium, the slag containing vanadium and iron is reduced to ferrovanadium with ferrosilicon and lime. This alloy is sufficient for most technical applications.

Deposits and Production

Vanadium is a relatively common element, with a similar element frequency to chlorine and chromium. Its share of the continental crust is about 120 parts per million (ppm). The element occurs predominantly bound in different minerals. Despite the frequency of vanadium, deposits with high concentrations of the element are rare, many vanadium minerals do not occur frequently. Most of the vanadium is found in traces of other minerals, especially iron ores. The most important producing countries are South Africa, China and Russia.

Main applications: (Steel) alloys

91% of the vanadium mined in 2017 was used in a variety of alloys, mostly with the metals iron, titanium, nickel, chromium, aluminium or manganese. This makes vanadium particularly suitable for use in buildings, bridges, tunnels and automotive parts, as well as in the aerospace industry. In addition, pipelines are frequently lined with it and power lines or high-voltage pylons are reinforced with it. Vanadium is also used for many infrastructural applications such as chemical

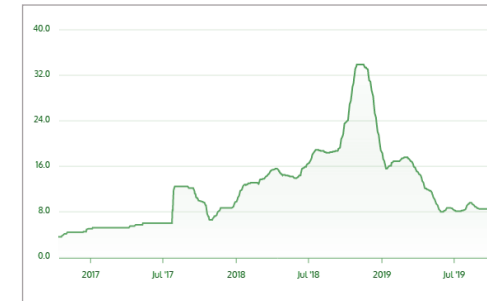
plants, oil refineries, offshore platforms, railways, railway wagons, freight containers, construction machinery and ships.

Use in the field of renewable energies as load balancing for wind farms and photovoltaic systems

Recently, there has been a growing use in the field of renewable energies for covering peak loads and load balancing, often in the immediate vicinity of wind farms or photovoltaic systems. By the end of 2018, more than 60 large vanadium redox flow accumulators were in operation worldwide. The largest such battery is located in Japan and has an output of up to 15 MW. Some vanadium redox flow systems are also in use in Germany. The largest vanadium flow battery in Germany, a river cell system with 660 cubic metres tank capacity and initially 1 MW capacity and 10 MWh energy storage capacity, was commissioned in 2017. The world's largest battery will also be a vanadium redox flow cell battery. It should be able to generate 200 MW and store 800 MWh of energy. It will be installed in the northeast of China on the peninsula near Dalian and will consist of ten units with 20 MW and 80 MWh each. Completion is expected in mid-2019. In July 2018, the Irish company redT was awarded the contract for a similarly large project to be implemented in Germany. The company signed an exclusivity agreement with Energy System Management GmbH (ESM), a German energy development company belonging to WWF solar, for the supply of two 40 MWh grid-connected energy storage projects in Germany, with a further 690 MWh of projects planned for the future.

Vanadium price had increased six-fold in the meantime.

The number of commissioned plants and their size have multiplied in recent years,



Vanadium price development over the last 5 years
(source: own presentation)

which is mainly due to the fact that ways must finally be found to make fluctuating power generators such as wind power plants or photovoltaic plants halfway capable of base loads by means of battery storage technologies. From the beginning of 2016 to the end of 2018, the price of vanadium rose six-fold to over US\$ 30 per pound, currently around US\$ 8. While experts expect global steel production to grow at only 2% per year from 2017-2025, the increasing intensity of vanadium consumption, combined with specific growth drivers for the end consumer, will allow vanadium demand to increase further. By the way: the growth of global steel production rates has caused 87% of the increase in vanadium consumption between 2001 and 2018.

Conclusion: The price of vanadium will continue to rise as the current production is needed only for steel production.

Vanadium therefore has one advantage: the current vanadium production is almost entirely required for the production of steel alloys. An expected demand from the area of the storage technologies cannot be covered at the moment at all. The expected exponential development in demand from this new area of application will therefore immediately lead to a supply gap in vanadium, which can already be seen from the steadily rising price of vanadium. On the other hand,

there are currently few or no new vanadium mines in operation. If this is the case, then vanadium can only be increasingly extracted within the next 2 to 3 years from old tailings piles, for example uranium mines. There will clearly be a need for new primary vanadium capacity in the future, which historically has always been a major challenge and cannot be met within 2 or 3 years. Vanadium, for example, will become a relatively unnoticed booming element, because one thing is certain: the decentralized storage of excess energy will become THE decisive issue in the future when it comes to the question of where base-load energy is to come from to „refuel“ millions of electric vehicles.

Summary: The electro-revolution is just about to take off and will lead to a long-lasting boom in lithium, cobalt, nickel and vanadium!

The demand for lithium, cobalt, nickel and vanadium will in future be mainly determined by three different parties:

1. From the Asian electronics companies that are mainly focused on the mass production of high-performance lithium-ion batteries and rechargeable batteries for everyday use, in multimedia devices, etc...
2. From the automobile manufacturers and (initially) above all Tesla Motors, but also from almost all established automobile manufacturers worldwide.
3. From the manufacturers of decentralised energy storage systems that are used wherever electricity is generated by photovoltaic or wind power plants and is to be used later by means of storage.

Interview with Tobias Tretter – Manager of the Structured Solutions Next Generation Resources Fund

This constellation will cause the demand for lithium, cobalt, nickel and vanadium to increase many times over in the coming years, with decentralized storage facilities generating the greatest growth in demand and even putting the other two areas in the shade.

A summary of the above is therefore not too difficult, a glance at the most important numerical estimates is basically sufficient. 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 from 2025. 25 million electric vehicles per year are expected from 2030, and 60 million vehicles per year from 2040. In parallel, lithium-ion battery demand will rise from 21 GWh in 2016 to 1,550 GWh in 2028! By 2021 alone, capacity demand will increase to an estimated 270 GWh, driven by the expansion plans of the upcoming storage production giants LG Chem, Samsung SDI, CATL, Lishen, Tesla and others.

Procurement from dubious sources and China's market power in reprocessing

Lithium, cobalt and also graphite belong to the so-called „red group“ in the EU and thus also in Germany, i.e. to materials with a very high supply risk. Most of them come from countries with dubious mining methods or high political risk. In

addition to the actual procurement risk, issues such as lack of environmental compatibility or lack of social acceptance also play a role. Another crucial point is that China currently controls a large part of cobalt and lithium processing. A circumstance that will lead in future either to more projects outside China's sphere of influence or to higher prices. Recycling does not play any role at the moment and can therefore not be seen as a source of required materials.

The imminent supply shortfall will reward the most advanced developers in particular

On the whole, there are signs of a supply shortfall in the lithium, cobalt, nickel and vanadium markets, as the increase in demand is likely to (far) exceed the increase in supply in the future. As there is no end in sight to the increase in demand beyond 2025, and as there are no major production projects worth mentioning in the pipeline, this situation is likely to continue for the foreseeable future.

The development companies in particular, which have already advanced their respective projects, should offer the greatest price opportunities in the coming months, also with regard to possible consolidation, i.e. takeover scenarios. Some of these committed development companies, as well as prospective producers, are presented below.



Energy Fuels' White Mesa
Vanadium-Uranium Processing Plant
(Source: Energy Fuels)

Mr. Tretter, the prices of many battery metals, especially lithium, have fallen noticeably in recent months. When will the big breakthrough for battery metals and corresponding stocks come?

We have already invested in battery metals since 2009 and I am firmly convinced that we have so far only seen the beginning of a long-term cycle. The switch to electromobility has so far primarily been an issue in the media, and to a small extent already in practice in Asia, but otherwise we are still a long way from penetrating the mobility sector. But electromobility will continue to advance inexorably. We are on the verge of significant milestones. In my opinion, the big breakthrough came with the sale of the first e-cars of the big manufacturers. So far, private individuals can only buy relatively expensive cars, such as Tesla or BMW i8, and the cheaper models are still significantly more expensive than equal gasoline or diesel cars. The broad mass market is still completely untouched. This will change with the upcoming model offensive of the renowned manufacturers and the infrastructure for electric cars is also improving every day. We expect a surprising effect in 2021 and 2022 in particular, when the renowned manufacturers come onto the market with new electric models. This should also be the time at which it will become clear to the market that we are heading undiminished for an extreme bottleneck in battery metals and that we will probably not be able to close it at all. If around 180,000 tons of lithium are currently produced, at least 800,000 to 1 million tons of lithium will be required by 2025. China alone will need over 500,000 tons of lithium per year (!) for the spent target of 7 million electric cars sold. An increase in production which, from today's point of view, is not only unlikely, but seems completely impossible.

Research into new battery concepts – nickel-manganese-cobalt-oxide batteries and solid-state batteries – is in full swing. Which battery metals will play the most important role in the future?

This is one of the crucial questions. If we participate in the international lithium conferences, the discussions will not revolve around the extent to which electromobility will prevail or whether the price of lithium will rise or fall in the coming months, but primarily around the extent to which it can be ensured that there will be enough lithium at all for the switch to electromobility and the coming generations of lithium batteries. There are constant innovations here and in the coming years there will be enormous changes and corresponding improvements in the batteries. First and foremost, I do not mean that batteries are getting cheaper and cheaper, but in particular that batteries are getting longer lasting, or that they can store more energy in denser space with less weight. The proverb says that the range of cars will be significantly extended in the coming years and by reducing the weight of the battery, energy consumption will of course also be reduced accordingly. In the coming years there will be a move away from NMC (111) towards NMC (532) and finally NMC (811). NMC stands for nickel, magnesium and cobalt and the number corresponds to their ratio. The use of nickel will therefore gradually increase over the coming years at the expense of magnesium and cobalt. The proportion of lithium, on the other hand, will remain constant. The lithium content of the NCA (nickel-cobalt aluminum) batteries preferred by Panasonic and Tesla will also remain the same in the next generation, only the cobalt content will be further reduced in favor of nickel. And last but not least, of course, the Holy Grail, the commercial use of solid-state batteries, is approaching. All battery manufacturers work at high pres-



Tobias Tretter has been active in the mining sector since 2000. During his activity at Dr. Jens Ehrhard Wealth Management he supported the management of the DJE Gold & Resources Fund, which was awarded as the best performing commodity fund of 2003. From 2005 to 2008 he co-managed the Stabilitas Funds, which have been awarded as the "best performing Gold Fund" in 2006. Since 2009, Mr. Tretter acts as CEO and responsible person for the Index- and Portfolio-Managements of Commodity Capital AG. He is managing the Commodity Capital Global Mining Fund (ISIN: LU0459291166), the Structured Solutions Lithium Index Strategie Fund (ISIN: LU0470205575) and the Managed Accounts of Commodity Capital. Tobias Tretter holds a business diploma degree from the University of Bayreuth.

sure on the solid-state battery, which does without liquid electrolytes to transport the voltage. In addition to the advantage of a higher energy density, solid-state batteries can also be charged faster. They are smaller, lighter, safer and offer more range. However, in practice, research still needs to be carried out outside the laboratory on the service life and performance of the batteries at low temperatures, for example. Nobody doubts that the solid-state battery will revolutionize all electromobility, so the entire industry is already looking forward to the Olympic Games next year. Toyota would like to use this to present its first production-ready (!) solid-state battery in an effective advertising campaign after only recently announcing its own target of 1 million sold electric cars per year from 2030 to 2025 to move forward. In addition to VW, Toyota in particular is regarded as one of the pioneers of electromobility among the renowned automobile manufacturers.

For us as investors, the developments in batteries primarily mean that there is no way around lithium. There is no alternative to lithium and there will be no practical alternative for the next 5 years. With regard to other battery metals, we currently see a supply gap for cobalt, which should drive prices up again in the medium term. At the latest with the solid-state battery, however, cobalt will no longer play a role in the production of batteries. Nickel, on the other hand, is one of the most critical metals for us, and in addition to lithium we see an enormous supply bottleneck for nickel in particular, which cannot be eliminated in the short or medium term. We are not surprised that nickel has been the best performing raw material since the beginning of the year, and we expect nickel to outperform in the coming months as well.

In recent months it has been observed that a veritable lobby has formed against the electric car. It is repeatedly argued that the mining of battery me-

tals required for this purpose either pollutes the environment (for example through excessive water consumption in lithium production) or inhumane mining methods – keyword child labour in cobalt production in the Congo – are used. What's your opinion?

As so often in life you have to look at things in a differentiated way and there is no black and white. Let's talk about cobalt first. Cobalt production takes place primarily as a by-product of copper production and the copper projects in Congo in particular are rich in cobalt. And while there are extreme environmental regulations in North America or Australia, there are no regulations in Africa, especially in the Democratic Republic of Congo (DRC). Child labour, lack of safety standards or the use of mercury are strictly prohibited in most countries but are still standard here. So, it is not the extraction of cobalt itself that is reprehensible, but the way in which it is extracted and the lax controls and regulations that are in place, if there are any at all. Ultimately, we as investors and buyers have a duty. Do we want cobalt from the Congo, or do we pay 20% more and get the cobalt from a harmless mine e.g. from Idaho in America? However, if we want investors to have the last percent margin, or if we are satisfied with a lower margin, we know that our money can be used to sustainably mine raw materials. For our part, we do not invest in countries such as the DRC, China or Mongolia. Africa is not a No Go for us, but it is extremely difficult to continuously check the working conditions, etc., so that we largely refrain from investments in Africa. There is currently no company in the portfolio that is primarily active in Africa.

When we talk about lithium, we first have to look at the alternatives. And these are first and foremost the conventional combustion engine and secondly the fuel cell. The conventional combustion engine is extremely efficient, and every driver knows the advantages and disadvantages

of producing and burning petrol and diesel. Now we can no longer turn back the clock and politics wants to move away from fossil fuels and the excessive emission of CO₂. The fuel cell is certainly an alternative, but the efficiency of the fuel cell is significantly lower than that of lithium batteries. In particular, the discrepancy between the theoretical efficiency achievable in the laboratory and that in practice is striking. For example, a lot of energy is lost during the activation of the chemical reaction of the car in the cold state. If the car is warm, on the other hand, the energy of the water vapour produced sinks. There are also problems with storage and energy losses during refuelling. Ultimately, research is certainly not at an end here, but there are indications that the fuel cell can be used in buses or trucks. Also, in our discussions with the big battery manufacturers there were no fears that the electric car would not prevail. China has provided very clear fronts in this respect. The electric drive is the only alternative for the future in the Middle Kingdom. If we now come to the conclusion that there is no way around the lithium battery and that lithium is irreplaceable as a raw material in the future, the question arises as to how we can extract lithium most sustainably. And there are two methods. On the one hand from dried out salt lakes and on the other hand from solid rock the so-called Hard Rock projects. Hard Rock projects are currently mainly in production in Australia. Lithium is broken down there, processed and then sent as a concentrate to China. There it is processed into lithium carbonates or hydroxides in refineries. A sustainable process in itself, even if it would be desirable if the lithium could be processed directly in Australia, as the final processing is very energy intensive and most of the electricity in China is still produced from coal.

Let us now move on to the second mining process, the extraction of dried salt lakes from Brines, mainly in South America. Here, water containing salt and lithium

is extracted from a depth of several hundred metres and then evaporated in huge basins before it is finally processed further. This process is often described as harmful to the environment. However, there are a few factors that need to be considered. First, long-term studies are needed to ensure that water abstraction is environmentally sound. The salt lakes are by far not as „dry“ as you might think. The projects are dependent on sufficient water flowing from the surrounding mountains and on water reservoirs not being reduced. You have to imagine the whole thing as a cave system in which the water flows, but it also prevents the whole structure from collapsing. As the lithium projects are designed for several decades of production, it is crucial to control the flow of water and ensure that the groundwater level does not sink. So, the environment would be particularly polluted if you produced too much. This was also one of the reasons why we were sure that the gigantic expansion of the Atacama Salt Lake at the beginning of last year, which hovered like a sword of Damocles over the sector, could neither be realized in the size nor in the desired time span. The production of raw materials is always an intervention in nature, but one can manage these interventions accordingly sustainable and from our project visits I can report that this is also the case in the vast majority of cases. And black sheeps, which circumvent laws or criminal machinations unfortunately exist in all sectors.

Some of the most important storage sites for battery metals are located in regions that have not exactly shone with political security recently (keyword Argentina). What role could geopolitical uncertainties play in the future supply of battery metals?

I don't think the political risks are even rudimentarily included in the current lithium price and they are causing extreme headaches not only for us investors but

for the industry as a whole. The problem in the mining sector is unfortunately that you cannot simply mine projects like a factory and rebuild them elsewhere. Additionally, you need 10 years from the discovery of a deposit to the final production and then another 3 years to earn the initial investment (break-even). This means that political stability is one of the most important factors for investment in mining projects, and this is precisely where the problem currently lies. A large part of the Brine production comes from the salt lakes in Chile and Argentina. Argentina is certainly not famous for long-term stability, and the current year-end election has also seen a return of dark storm clouds. After Mauricio Macri had created a more investment-friendly climate in Argentina in recent years, the current primary elections indicate that the populist Alberto Fernandez, who belongs to the camp of Christina Fernandez de Kirchner, should win the elections. After investor-friendly years, this is now likely to change again, and it will be very difficult for most companies to find investors for projects in Argentina in the future. Chile is generally known for its long-term stability, but there are dark clouds that make it difficult for investors to invest money in new projects. Although the country is very investment-friendly, every company needs corresponding licenses and permits from the state-owned Corfo company to export lithium. And that's exactly what shocked us as investors only recently at the biggest lithium conference in Santiago, when it was announced to confiscate 25% of the theoretical (!) production from SQM and to sell it to interested parties independently. Corfo thus confiscates more than 10% of total global production from one of the top producers. For us it is certainly not an action that we would have expected from a country that advertises with investment friendliness, but rather reminds us of the action of socialist regimes. All in all, we currently see an increase in political risks, particularly in South America.

The Hard Rock production takes place primarily in Australia, one of the most stable countries in the world. However, the companies currently have to sell the lithium concentrate to China and are therefore very dependent on a partner who is not necessarily famous for transparency and fair behaviour. Without political risks, we see little chance of expanding production to up to 1 million metric tons of lithium by 2025. With the increased risks and, in particular, the increased uncertainty regarding long-term stability in South America, we regard this goal as unattainable.

In addition to the points already mentioned, what do you pay particular attention to in your assessment of a battery metal mining company or a corresponding resource?

In addition to many geological and technical aspects, the quality and track record of the management, in addition to the political stability already mentioned, is decisive for us. Besides all the problems the sector faces, one is the most serious! And that's the lack of experts. We fly to all our core investments and look at the projects directly on site to convince ourselves that the project is sustainable, that the local population is involved in the project and that the management is able to take the necessary steps not only to explore the project or bring it into production, but also to raise the necessary capital, to maintain the relationship with the local population and to obtain the environmental permits quickly and successfully.

You are Manager of the Structured Solutions Next Generation Resources Fund. What battery metals or equities does this fund cover?

We try to invest in all battery metals, but still follow a stock picking approach. This sometimes makes it difficult to find the

right companies even though we are convinced of the potential of a raw material. The focus of our investments is focused on lithium companies, as we believe they will be the biggest winners in the transition to electromobility. In addition to lithium, the portfolio also includes a cobalt company and various base metal companies. We see the greatest potential in nickel and copper, which was sold off too heavily due to the trade dispute between the USA and China and where the fundamental outlook remains excellent. The expansion of the electricity supply and the development of the corresponding infrastructure for electromobility require huge quantities of copper and many of the old mines are nearing their end. On the other hand, new projects are in short supply and we expect a deficit here in the coming years.

Finally, let's take a look at the opposite side of the supply chain, the battery and car manufacturers. From your point of view, who is currently ahead in this area and why don't the big names actually enter the mining sector themselves?

It is certainly difficult to answer the question of who the lead will ultimately have, but for our investments it is not really decisive who will prevail in the end. Similar to the sellers of shovels during the gold rush. It didn't really matter who found the gold as long as all wanted the shovels to dig. We believe in the success of electric mobility. Who will eventually emerge as the winner will be revealed, but I wouldn't be surprised if a completely new player like Google would ultimately emerge as the winner. The technical requirements for an electric car are certainly many times lower than for a car with a combustion engine and ultimately autonomous driving and networking will probably be the decisive factors. But as I said, it is impossible to say how such a young sector will develop in the coming years.

Why the big producers are so reluctant to invest in mining companies is, however, easier to explain. The companies simply lack the know-how and in the past decades they have tried to outsource all „non-core competencies“ and reduce the value chain as much as possible. Now to go 5 steps back and take care of the production of the raw materials yourself is of course difficult. However, we are seeing the first signs that car manufacturers are realizing how serious the lithium supply shortage will be. Toyota and Tesla have already entered into joint ventures with mining companies and VW and BMW have also signed an agreement in recent months for the supply of lithium with Gangfeng. It is particularly interesting in this context that Gangfeng has concluded long-term supply contracts with Tesla, BMW, LG Chem and VW, but there was no explanation as to how far Gangfeng can produce the lithium itself. We are extremely curious where the production for the concluded contracts will come from and see Gangfeng as a company that will be forced to buy new producers with a premium in the coming years.

Defense Metals

Rare Earths to Secure National Defence



Defense Metals is a Canadian mining development company specializing in prospective rare earth and uranium projects in Canada. The Company owns Wicheeda, one of the most prospective rare earth projects in British Columbia, the region with the highest rare earth grades in Canada, and two uranium projects in the Athabasca Basin surrounded by major uranium companies and high-grade uranium projects, respectively.

Flagship project Wicheeda – Location and infrastructure

The Wicheeda Rare Earths (REE) project is located approximately 80 kilometers northwest of the city of Prince George in the Canadian province of British Columbia. It is relatively easy to reach via an all-weather forest road that leaves Highway 97. Wicheeda is close to major infrastructure such as power transmission lines, railways and motorways. A large hydroelectric power line and a Canadian national railway line, as well as the town of Bear Lake are in the immediate vicinity. As well as well-trained mining personnel who can be recruited from the strategically located Prince George Mining Centre.

Flagship project Wicheeda – Acquisition

In November 2018, Defense Metals entered into an option agreement to acquire 100% of the shares of Spectrum Mining Corporation. In return, the company committed to investing at least CA\$1.93 million in the development of the project within 36 months. In addition, 370,000 CA\$ were paid in cash and 200,000 treasury shares plus a further 50,000 CA\$ were transferred in treasury shares.

Flagship project Wicheeda – Geology

Wicheeda consists of 6 mineral claims covering an area of 1,780 hectares. Geologically, the Wicheeda project is located in the Foreland Belt and Rocky Mountain Trench, an important continental geological trend in western Canada. The Foreland Belt hosts a critical portion of a large alkaline magmatic province stretching from the Canadian Cordillera to the southwestern United States. It also hosts several carbonatite and alkaline complexes, including the Aley (niobium), Rock Canyon (REE) and Wicheeda (REE) alkaline complexes, which contain the highest concentrations of rare earth metals in Canada.

The Wicheeda Project is surrounded by metasedimentary rocks of the Kechika Group penetrated by a southeast trending carbonatite. Wicheeda carbonatite is a deformed plug or threshold of approximately 250 meters in diameter that hosts potentially economic REE mineralization. The penetration comprises a ferroane-dolomite carbonatite core, which gradually changes to calcite carbonatite on the outside. The potentially economic REE mineralization is absorbed by the dolomite carbonatite. The favourable mineralogy and lanthanide distribution make Wicheeda a very attractive deposit for so-called Low Rare Earth Elements (LREE), i.e. for light rare earths, which are mainly used in military applications.

Flagship project Wicheeda – Previous Exploration Work

What you should know in advance: Most rare earths are kept in a certain rare element mineral, the bastnäsite. There's more than enough of that on Wicheeda. In the 1970s, strong zinc mineralisation was first detected on Wicheeda. Early work also identified the presence of ele-

vated levels of niobium. Teck Corporation acquired the project and carried out geological mapping, soil characterization, geochemical sampling, soil magnetometry and blasting from 1985 to 1987. These works outlined several areas containing light rare earth elements as well as niobium, barium, strontium, zinc & fluorine. The so-called „Main“ zone contains a geochemical cerium anomaly measuring 1000 metres x 500 metres and containing 400 parts per million (ppm). In 2010/11, flotation and hydrometallurgical testing of Wicheeda drill cores was completed. This work successfully developed a flotation flow diagram that recovered 83% of the rare earth oxide and yielded a concentrate with 42% REO. Subsequent hydrometallurgical investigations in 2012 on a 2-kilogram sample of a 39.7% TREO concentrate showed an improved and purified failure containing 71% TREO.

Flagship project Wicheeda – resource estimation + own exploration activities

In January 2019, The Company published a first resource estimate for the Wicheeda project. It has at least 11.37 million tonnes of rock with an average of 1.96% LREE in the inferred category.

In May 2019, the Company received drill permits for more than 50 drill targets, initially issued for 5 years. In August 2019, work began on a 2,000-metre drill program. All drilling intersected significant layers of dolomite carbonate with visible rare earth mineralization. Drilling was carried out in the area from which the Company collected a 30-ton Bulk Sample at the end of 2018. Selected test results for the 30-tonne mass sample included 1.77% lanthanum oxide, 2.34% ceria, 0.52% neodymium oxide and 0.18% praseodymium oxide, which the

Company believes to be potentially economically significant. At the end of September 2019, the company completed the 13th and for the time being final borehole and was able to expand the deposit in several directions. The last hole intersected a 130-metre core length interval of visible REE mineralized dolomite carbonatite, leaving the deposit open for north expansion.

Uranium projects Geiger and Klapproth

In addition to the Wicheeda Rare Earth Project, Defense Metals also holds two uranium projects in the Athabasca Basin. The Geiger project consists of two claims, Geiger North and Geiger South, totaling 1,233 hectares and adjacent to the Wollaston-Mudjatik Transition Zone - an important crustal seam associated with most of the major uranium deposits in the eastern Athabasca Basin. The project is located approximately 35 kilometers northwest of the McClean Lake Mine and Mill in a relatively unexplored area of the Athabasca Basin.

The Klapproth properties consist of two claims and cover approximately 8,130 hectares. Both projects in the Athabasca Basin are surrounded by several major mining companies, providing the Company with a strategic foothold in a proven uranium deposit.

Not far from Geiger North, neighbor ISO Energy has already detected 1.26% U3O8 over a length of 8.5 meters on its Larocque East project, among others.

Top management team

Defense Metals has a highly experienced and successful management team. Director Max Sali is President of Baccharat Investments Inc, a private company that provides investment, advisory and

management services to public companies. Sali is also CEO, Director and Founder of Barrian Mining. Most recently, he worked for Advantage Lithium, a company that has evolved from a shell to a positive PEA and has financed \$42 million to date.

In January 2019, Dale Wallster joined Defense Metals. Wallster is a geologist and gold prospector with 35 years experience in the exploration of North American mineral deposits, with a focus on the development and discovery of unconformity-related uranium deposits since 2002. He was President and Founder of Roughrider Uranium Corp., a company acquired by Hathor Exploration Ltd. in 2006 for its strategically located uranium properties in the Athabasca Basin. Wallster and his team are well known in mineral exploration for the discovery of Hathor's Roughrider deposit. In January 2012, Hathor became a wholly owned subsidiary of Rio Tinto through a US\$650 million acquisition. Defense Metals should benefit greatly from Dale Wallster's advice on the technical advisory board.

Summary: Early Stage Opportunity with Top Potential

Defense Metals is a clear early-stage opportunity. The flagship Wicheeda project was recently acquired, so the company started from scratch. The Company owns three potentially high-grade uranium and rare earth projects in designated prime locations including very well-developed infrastructure. Especially the combination of uranium and rare earths offers North America an ideal opportunity for vertical integration to support the fast-growing battery sector and reduce dependence on China. In view of the disastrous supply chain in the USA in particular, there is a great deal of catching up to do in military applications, especially in the uranium sector, and there is great market potential. Defense Metals has a new and strong management team, which is at full throttle right from the start. Only around 30 million shares issued make Defense Metals a narrow and potentially explosive value.

rified oxide product, in addition to completing an updated mineral resource estimate based on the positive 2019 drill results, the results of which will be expanding on the Wicheeda Deposit size.

The Company has submitted its initial batch of 124 drill core samples from its 2019 drill program to ALS Global (ALS) analytical laboratories, Kamloops, BC. ALS is an International Standard (ISO/IEC) 17025:2005 and ISO 9001:2015 certified analytical testing facility. Defense will provide additional updates as work progresses.

Potential Q4 2019 and 2020 Strategic Goals:

- ▶ Finalize the bench-scale REE flotation concentrate testwork and flow sheet (Phase 1a)
- ▶ Complete bench-scale hydrometallurgical testwork to produce a purified mixed REE oxide product (Phase 1b)

- ▶ Update current geological model incorporating the 2019 diamond drill results and commission an updated NI 43-101 Wicheeda Deposit Mineral Resource Estimate
- ▶ Initiate full-scale flotation pilot plant on the 30-tonne bulk sample (Phase 2)
- ▶ Commence base-line environmental studies and monitoring at the Wicheeda site.

Exclusive interview with Craig Taylor, CEO of Defense Metals Corp.

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

2019 was a year of significant growth for Defense Metals. The Company was encompassing strategic corporate financings, acquisition of the Wicheeda Rare Earth Element (REE) Deposit, collection of a 30 tone surface bulk metallurgical sample, completion of a maiden mineral resource estimate comprising 11,370,000 tonnes averaging 1.96% TREO (Total Rare Earth Oxide) in British Columbia,

and the building of a dynamic and experienced team to lead the Company going forward.

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

In Q4 2019 and 2020, Defense Metals will continue to advance key project metrics including; finalizing bench-scale process metallurgy recoveries and REE crometallurgical testing to produce a pu-

ISIN: CA2446331035
WKN: A2PBZ4
FRA: 35D
TSXV: DEFN

Outstanding shares: 30.2 million
Options: 2.8 million
Warrants: 7.5 million
Fully diluted: 40.7 million

Contact:
Defense Metals Corp.
605 – 815 Hornby Street
Vancouver, BC V6Z 2E6, Canada

phone: +1-833-562-9916

todd@blueskycorp.ca
www.defensemets.com

Defense Metals Corp.





Mark Jarvis, CEO

Giga Metals is a Canadian mining development company focused on the development of its huge Turnagain nickel-cobalt project in the Canadian province of British Columbia. Turnagain is considered one of the largest nickel-cobalt projects in the world, prompting the Cobalt Royalty Company Cobalt 27 to secure a corresponding net smelter royalty in 2018 at a price higher than Giga Metals' market capitalisation at the time.

Turnagain Nickel-Cobalt Project – Location and Infrastructure

Turnagain is located just north of the Turnagain River near its confluence with the Hard Creek. The community of Dease Lake, on Highway 37, is located 70 kilometers west of the license area. A side road extending east from Dease Lake has been used in recent years by large articulated four-wheel drive vehicles to transport large chunks of jade from the Kutcho Creek area and supply the gold operations at Wheaton Creek. Part of this road network extends to the Turnagain area. Furthermore, there is a short runway on the area. A helicopter flight from Dease Lake to Turnagain takes about 20 minutes.

Turnagain Nickel-Cobalt Project – Deposits and Geology

Giga Metals holds 100% of Turnagain, which hosts multiple zones of significant nickel, cobalt, copper, platinum and palladium anomalies. Most of the known resource comes from the Horsetrail and Northwest zones, which cover an area of approximately 2.5 by 1.5 kilometres. The Attic Zone, approximately 3.5 kilometres to the northwest, shows higher concentrations of platinum and palladium, while a zone 2.5 kilometres to the northwest of

Horsetrail shows increased traces of copper.

A new resource estimate released in September 2019 returned a NI43-101 compliant resource that includes Measured and Indicated resources of 1.07 billion tonnes of rock containing 0.22% nickel and 0.013% cobalt (5.2 billion pounds nickel and 312.4 million pounds cobalt). In addition, inferred resources of 1.14 billion tonnes of rock were identified with 0.217% nickel and 0.013% cobalt (5.47 billion pounds nickel and 327.3 million pounds cobalt). This represents an increase of 28.3% in the Measured and Indicated category and 27.2% in the Inferred category compared to the 2011 resource estimate for nickel. For cobalt, the measured and indicated category increased by 23.5% and the inferred category by 16.9%. Overall, only a fraction of the area has been drilled to date with signs of nickel occurrence. Especially in the area north of the two main occurrences Horsetrail and Northwest further nickel anomalies could be detected, which can significantly expand the already huge resource.

Extensive metallurgical testing has also shown that froth flotation (foam flotation) can reliably produce a clean concentrate containing 18% nickel and 1% cobalt. It is a concentrate which can be further processed into high-purity Class 1 nickel for use in lithium-ion batteries. Cobalt was originally only intended as a by-product but is now contributing to the long-term profitability of the project.

Turnagain Nickel-Cobalt Project – Economic Evaluation

Turnagain already has a positive Preliminary Economic Assessment (PEA) from 2011, which evaluated the development of the Turnagain deposit in conventional

Turnagain Mineral Resource							
Resource Category	Tonnes (000's)	Ni (%)	Co (%)	Contained Ni (tonnes)	Contained Co (tonnes)	Contained Ni (Mlbs)	Contained Co (Mlbs)
Measured	360,913	0.230	0.014	831,182	49,806	1,832	110
Indicated	712,406	0.215	0.013	1,530,248	91,900	3,374	203
Measured & Indicated	1,073,319	0.220	0.013	2,361,430	141,707	5,206	312
Inferred	1,142,101	0.217	0.013	2,482,926	148,473	5,473	327

Updated resource estimate,
Release September 2019
(Source: Giga Metals)

open pit mining. It was assumed that the material would be processed with a conventional concentrator to produce an 18% nickel and 1% cobalt concentrate.

Based on a nickel price of US\$8.50 per pound and a cobalt price of US\$14.00 per pound, this resulted in cash costs of US\$4.26 per pound of nickel, after-tax discounted net present value (NPV) of US\$724 million and after-tax profitability (IRR) of 13.5%. The initial cost of capital was estimated at US\$ 1.357 billion, the expansion costs after 5 years at an additional US\$ 492 million. The estimated payback period at that time was 7.3 years and the mine life 27.2 years. In the first 5 years a total mill flow of 15.8 million tons of rock per year was expected, from the sixth year onwards 31.3 million tons per year. Annual production for the first 5 years was estimated at 23,912 tons of nickel and 1,280 tons of cobalt. For the following years, annual production was expected to be 44,393 tonnes of nickel and 2,433 tonnes of cobalt. It should be noted that this PEA is based on much fewer resources than are currently known and that the current nickel price is well below the assumed US\$8.50 per pound. The cobalt price assumed at that time appears realistic and could even be set higher. With the available figures Turnagain would be one of the 10 largest nickel producers worldwide.

The aim of the company is to complete a pre-feasibility study in the near future, within which the high capital costs will be reduced.

Turnagain Nickel-Cobalt Project – Recent Drilling Successes

In 2018, Giga Metals conducted an extensive drilling campaign, totaling 40 holes with a total drill length of 10,835 metres. The focus was primarily on upgrading the inferred resources to the indicated category. Reported assay results showed remarkable continuity of mineralization in the Horsetrail and Northwest Zones and high platinum and palladium concentrations in the so-called Attic Zone, located approximately 3.5 kilometres northwest of the Horsetrail Zone.

Overall, Giga Metals has been able to report some very impressive, very long intervals of significant nickel and cobalt mineralization. These include approximately 447 metres of 0.258% nickel and 0.013% cobalt, 444 metres of 0.25% nickel and 0.013% cobalt, 388 metres of 0.257% nickel and 0.015% cobalt, 370 metres of 0.276% nickel and 0.013% cobalt, 327 metres of 0.208% nickel and 0.012% cobalt and 314 metres of 0.214%

nickel and 0.016% cobalt. All these drilling sections began almost directly from the surface! Up to 0.471% nickel, 0.13% cobalt, 367ppb platinum and 467ppb palladium over 80 metres have been reported from the platinum- and palladium-rich Attic Zone.

Royalty company on board

In July 2018, Giga Metals Management succeeded in a real coup. A net smelter agreement was signed with Cobalt 27 Capital Corp., a leading Cobalt Royalty Company and physical cobalt buyer. Accordingly, Giga Metals sold a 2% net smelter royalty for future cobalt and nickel production under the Turnagain project to Cobalt 27 Capital for US\$1 million in cash and 1,125,000 Cobalt 27 shares. The equivalent of US\$10 million was higher than Giga Metals' market capitalization at the time of the announcement. The Company will use the funds to explore the Turnagain project and to develop the project into a pre-feasibility study and beyond. In April 2019, Giga Metals also appointed Anthony Milewski, Chairman and CEO of Cobalt 27, to the Giga Metals Board of Directors. Milewski has an incomparable knowledge of the institutional market and the strategic players in the field of battery metals.

Exclusive interview with Mark Jarvis, CEO of Giga Metals Corporation

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

During the past 12 months, we drilled 36 infill holes in the proposed starter pit areas of our deposit. This drilling has en-

Summary: Large lever on a growing nickel boom

Giga Metals strives to be a leading supplier of battery metals needed in the future with clean energy as the world progresses. To this end, the company is currently concentrating on two of the most important metals used in the batteries of electric vehicles: Nickel and cobalt.

The Turnagain Project is one of the largest undeveloped nickel-cobalt sulphide deposits in the world in terms of total nickel. The growth of electric vehicles and energy storage is accelerating, so the Turnagain project should be able to develop rapidly, especially after Cobalt 27, one of the most important cobalt players in the world, provided a lot of confidence. The next important catalyst is the pre-feasibility study, which should be completed shortly. Together with the new resource estimate, a situation should develop which corresponding majors and/or battery manufacturers should use to offer Giga Metals. In April 2019, Giga Metals was able to flush more than 1 million CA\$ from the exercise of warrants into its own cash register.

abled us to publish a new, 43-101 compliant resource estimate in which all of the resources in the areas we propose to mine are in the Measured and Indicated categories. This means that all the resource drilling that is needed to support

advancing the engineering to the Pre-Feasibility and Feasibility levels has been completed. The current sulphide resources now stand at 5.2 billion pounds of nickel and 312 million pounds of cobalt in the Measured and Indicated categories with another 5.5 billion pounds of nickel and 327 million pounds of cobalt in the Inferred category. A resource of this size ranks the Turnagain nickel-cobalt sulphide deposit as one of the world's largest undeveloped projects.

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

Over the next few months our metallurgical work program will optimize our flow sheet and provide robust variability testing. At present, Turnagain metallurgy indicates production of some of the highest nickel grade concentrate available when compared to existing operations worldwide. This work will support an updated Preliminary Economic Assessment

to guide us into a Pre-Feasibility Study and provide concentrate samples for evaluation by potential strategic partners. We expect this work to be completed by the end of the first quarter of 2020.

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

It is becoming very apparent that Class 1 nickel will be the key material in terms of supply bottlenecks for Li-ion batteries. Only large sulphide nickel projects such as our Turnagain project or High Pressure, High Temperature Acid Leach projects (HPAL) can economically provide large quantities of nickel at the requisite purity for the battery supply chain. Our project is competitive with HPAL projects in terms of the usual financial metrics and is also a more ethical source of material in terms of environmental and social impacts.

ISIN: CA37518K1021
WKN: A2DWUW
FRA: BRR2
TSXV: GIGA

Outstanding shares: 55.1 million
Options: 5.2 million
Warrants: 12.2 million
Fully diluted: 72.5 million

Contact:
Giga Metals Corporation
Suite 203, 700 West Pender Street
Vancouver, BC, V6C 1G8, Canada

phone: +1-604-681-2300

info@gigametals.com
www.gigametals.com

Giga Metals Corporation



Lithium Chile

17 top-class projects in the hottest lithium region of the planet



Steven Cochrane, CEO

Lithium Chile is a Canadian development company focusing on the development of lithium projects in Chile, currently the world's hottest lithium region. The company currently owns licenses with a total area of over 160,000 hectares, making it the largest license holder in Chile.

Chile – country with the highest lithium reserves and lowest mining costs worldwide

With its involvement in Chile, Lithium Chile has chosen the most important lithium hot spot of all. Chile offers several advantages to foreign mining companies. First, the country has the most lithium reserves in the world. More than 50% of the world's known reserves are hidden in the sometimes extremely high-grade salars and await their uplift. Although Bolivia possesses more lithium than Chile, the deposits there have not yet managed to exceed the much higher risk status of resources. The second important point is the cost of the subsidies. These are currently around US\$ 1,800 per tonne in Chile. By way of comparison, in Australia you have to spend around US\$5,000 to produce one tonne of lithium. In Chile, two decisive factors play a decisive role here: the relatively high grades of evaporation and a high evaporation rate, which accelerates the production process. A third important point is Chile's well-known straightforward approval procedure. The country is considered by mining companies to be one of the best jurisdictions in the world.

17 top-class projects – Largest land package in Chile

Lithium Chile currently holds exploration concessions on 17 lithium projects, all of which are located in the north of the country. These concessions cover a total

of around 160,000 hectares, making Lithium Chile – apart from the Chilean state – the largest license package holder in Chile. The most important projects are presented below.

Salar de Coipasa

The Salar de Coipasa is located in the very north of Chile, directly at the border to Bolivia. The project area covers 13,100 hectares and has extremely high near-surface lithium grades. For example, samples were taken and up to 1,410mg/L lithium could be detected, which is on the same level as the grades of the two processing sites of SQM and Albemarle in the Salar de Atacama. Chemically, Coipasa seems almost perfect, since the ratio of lithium to potassium is only 0.06 and the ratio of magnesium to lithium is only 3.9.

In May 2018, a 58 square kilometer brine target zone with lithium contents of up to 1,410mg/L was identified in the license area. This has a thickness of between 100 and over 300 metres. The Company is currently working on a drilling program that will soon provide more detailed information on possible high-grade lithium deposits in the Salar de Coipasa. In April 2019, the Company received approval from the surrounding communities to drill for the project, which was commenced in April 2019.

The smaller Norte Project is located in the immediate vicinity, northwest of Coipasa.

Salar de Helados

The Salar de Helados is located in the northeast of Chile, directly on the border to Argentina and Bolivia. The proximity to the Salar de Atacama (only 80 kilometres to the west) provides Helados with a very good year-round connection to the existing infrastructure. The project area co-



The Xinjiang Group recently invested \$1.3 billion for a 49% stake in Salar de Coipasa on the Bolivian side.
(Source: Lithium Chile)

vers 22,700 hectares and has extremely high near-surface lithium grades. For example, samples of up to 1,280mg/L lithium could be detected, which is on the same level as the grades of the two processing sites of SQM and Albemarle in the Salar de Atacama. From a chemical point of view, the situation on Helados is similar to that on Coipasa, since the ratio of lithium to potassium is only 0.1 and the ratio of magnesium to lithium is only 2.6, which is even lower. In the course of a gravitational and geophysical program, Lithium Chile was able to announce the discovery of a lithium brine target of 60 square kilometers in February.

Salar de Atacama

Probably the most famous Salar in Chile, the Salar de Atacama, where the two lithium giants SQM and Albemarle operate corresponding processing facilities, is located in northern Chile, about 40 kilometers from the Bolivian border and about 80 kilometers from the Helados project. Due to the activities of SQM and Albemarle, they have an excellent connection to the existing infrastructure.

The project area, which is located in the very north of the Salar, covers 6,600 hectares and has extremely high near-surface lithium degrees. For example, lithium up to 1,330mg/L could be detected during sampling, which is on the same level as the grades of the two processing sites of SQM and Albemarle. From a chemical point of view, the ratio of lithium to potassium is also very good, at only 0.09, and the ratio of magnesium to lithium is only 2.6.

In 2018, several brine target zones with lithium contents of up to 1,330mg/L were identified in the licence area, each covering 20 to 25 square kilometres. These are located in the area of the northeast flank of the Salar and have a thickness of between 50 and over 75 meters.

Salar de Ollague

The Salar de Ollague is located in the north of Chile, directly on the border to Bolivia, with part of the project area even on Bolivian territory. The project area covers 2,200 hectares and has near-surface lithium grades of up to 1,140mg/L. Chemically, the ratio of lithium to potas-



sium is only 0.1 and the ratio of magnesium to lithium is a good 7.1.

In 2018 several brine target zones with lithium contents of up to 1,140mg/L were identified in the licence area, each covering 20 to 25 square kilometres. These are located in the area of the southwestern arm of the Salar and have a thickness of between 20 and over 200 metres.

As part of an extensive drilling program in August 2018, the company was able to demonstrate a lithium content of up to 480mg/L within a 180-metre-long section from the first drill hole. Three additional holes drilled to depths of 250 meters and 170 meters, respectively, also terminated in lithium/potassium mineralization up to 270mg/L and remain open to depth.

Salar de Turi

The Salar de Turi is also located in northern Chile, 30 kilometres from the Bolivian border and about 80 kilometres north of the Salar de Atacama. The project area covers 7,600 hectares and has near-surface lithium grades up to 590mg/L. Chemically, the ratio of lithium to potassium is only 0.05 and the ratio of magnesium to lithium is a good 7.8. The Company is currently working on an extensive geophysical study leading to a 3-hole drilling program. Initial positive results from an expanded TEM geophysical survey indicate that the highly conductive anomaly identified in previous surveys is wider and thicker, continues to the northeast along the Salar Basin axis and extends beyond the Company's previous property boundary. As a direct result, the Company expanded the project area by an additional 22 claims totaling 5,400 hectares to cover the anomaly extension of at least 63 square kilometres. In addition, an agreement was reached with the indigenous population to carry out the 3-hole program which will cover approximately half of the area.

Salar de Talar

The Salar de Talar is located in the northeast of Chile, about 50 kilometers southeast of the Salar de Atacama. The project area originally comprised 3,500 hectares including the smaller Capur project and has near-surface lithium grades of up to 740mg/L. The project area is located in the south of the country. Chemically, the ratio of lithium to potassium is only 0.1 and the ratio of magnesium to lithium is a good 4.5. The company is currently working on an extensive geophysical study.

Summary:
First hit landed! – Several more chances available!

Lithium Chile is still at an early stage of development. After all, the company did not start acquiring potentially high-caliber lithium projects in Chile until 2016. The largest license areas were not even added until 2017. With the help of some top-class and experienced mining specialists, it was possible to secure the largest portfolio of lithium projects in one of the best mining areas with extremely high-grade lithium results. The Company's objective is to initially sample all 17 projects, of which the most recent have not yet undergone major exploration activities. The lithium-bearing brines, which seem to be only a few metres deep, and the extremely high evaporation rate in Chile at the same time mean that promisingly low figures can also be expected for possible mining costs. In addition, the long-awaited drill program on Coipasa was launched, which is expected to result in an initial resource estimate of its own. Investors can look forward to a whole series of potential top results in the coming months.

Exclusive interview with Steve Cochrane, CEO of Lithium Chile

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

The company has achieved negotiating with the Local community to drill our flagship property on Coipassa. The Chinese just invested \$1.3 billion on the same Salar on the Bolivian side.

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

The next Catalyst in the next 6-12 months will be drilling our Flagship property Coipassa and coming out with a potential resource.

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

I see the current market pretty grim for the next 2 years but with a sunny horizon and major correction 2022-2023 full blast off 2025.

ISIN: CA53681G1090

WKN: A2JAHX

FRA: KC3

TSX-V: LITH

Shares outstanding: 101.9 million

Options: 5.1 million

Warrants: 2.1 million

Fully diluted: 109.2 million

Contact:

Lithium Chile Inc.

#900, 903 – 8th Ave.

S.W. Calgary, AB, T2P 0P7, Canada

phone: +1-403-852-7117

info@lithiumchile.ca

www.lithiumchile.ca

Lithium Chile Inc.



Mali Lithium – Very High Lithium Grades and Open Pit Production Possibility on One of the World's Largest Lithium Projects



Chris Evans, Managing Director

Mali Lithium, known until June 2019 as Birimian Limited, is one of the most active lithium exploration companies in Western Africa. The Australian company holds corresponding lithium and gold licenses with a scope of approximately 1,100 square kilometers in Mali. The development areas there are characterised by a very well-developed infrastructure and increased exploration and production activity. At the end of August 2019, Mali Lithium received permission to build and operate a mine for the next 30 years.

Goulamina Lithium Project – Situation

The main focus is on the development of the Goulamina Lithium Project. This was 100% acquired in 2016 and is located in southwest Mali, about 50 kilometres from the border with Guinea. The project area covers approximately 295 square kilometres. Goulamina is located about 150 kilometers south of Mali's capital Bamako. A main road runs directly through the project site. Energy and water are also available in sufficient quantities in the immediate vicinity.

Goulamina Lithium Project – Resource

Goulamina already has a very large and high-grade reserve of 31.2 million tonnes of rock with an average of 1.56% Li_2O , equivalent to 486,000 tonnes Li_2O . These reserves are part of a much higher resource of 43.7 million tonnes with an average of 1.48% Li_2O (equivalent to 645,000 tonnes Li_2O) in the indicated category and an additional 59.5 million tonnes with an average of 1.34% Li_2O (equivalent to 797,000 tonnes Li_2O) in the inferred category. Goulamina now has more than 1.38 million tons of Li_2O , making it one of the world's largest undeveloped lithium deposits. Goulamina itself is at least 700 metres long, but the resource has not yet been fully delineated

at strike length or depth. There is also increased potential in several other mineralized zones, most notably the Danaya Zone.

Goulamina Lithium Project – Prefeasibility Study, Definitive Feasibility Study and Production Decision

In July 2018, the Company was able to publish an updated pre-feasibility study for Goulamina.

According to this, an annual production and processing of 2 million tons of rock for the production of 362,000 tons of 6% Li_2O concentrate can be realized over a mining period of 16 years. The initial cost of capital was estimated at US\$199 million, including preliminary work and buffers. The average cash cost per ton of concentrate is expected to be US\$ 281. This results in a discounted net present value (NPV) of US\$ 690 million, an Internal Rate of Return (IRR) of very strong 49.5% and a payback period of 2.6 years. Average EBITDA for the year over the life of the mine is estimated at US\$ 128 million.

The company is currently working on the preparation of a Definitive Feasibility Study, which should be completed in the first quarter of 2020. At the same time, the company is working on optimising the areas most affected, on further approvals, on financing and on additional purchase agreements. The company intends to make a production decision in the second half of 2020. Recently, several project risks have been reduced or eliminated by, for example, obtaining permission to withdraw water from the nearby Selingue Dam and improving infrastructure, including reducing the use of diesel generators.

Goulamina Lithium Project – Metallurgy

In addition to its drilling results, Mali Lithium can also draw on data from metallurgical tests.

An average grade of 2.2% Li_2O could be determined from a bulk sample of three tons of rock. Test runs demonstrated the possibility of producing a high-grade lithium concentrate. A 6.7% chemical grade spodumene-lithium concentrate could be produced by screening and float-sink deposition alone. The recovery rate, i.e. the proportion of the total lithium in the rock that can actually be recovered from it, was a very high 84.7%, but in the pre-feasibility study it was initially only estimated at 70.4%. Further tests confirmed that the 6% spodumene concentrate can be used to produce battery-capable 99.5% lithium carbonate. Recent metallurgical tests have indicated that a recovery rate of approximately 80% can be achieved.

Goulamina Lithium Project – Memoranda of Understanding

At the end of 2018, the company signed a memorandum of understanding with the Changsha Research Institute of Mining and Metallurgy. Changsha is a division of China Minmetals Corporation, which is one of the largest mining service companies in China. This is primarily about discussing ways to jointly advance the Goulamina-Lithium project, including, but not limited to, project financing and offtake opportunities. It is also a matter of determining how the two parties can jointly develop or exploit the Changsha Group's expertise in relation to the project.

In December 2018, Mali Lithium also announced a letter of intent with General Lithium Corporation. This involves the annual purchase of 200,000 tonnes of spodumene concentrate, which would represent about 55% of the annual output. The parties have agreed to enter into discussions with a view to signing a binding agreement which will include price and volume arrangements. Delivery could therefore take place as early as 2020.

Massigui Gold Project

In addition to the high-grade lithium project Goulamina, the company also owns the promising gold project Massigui, which is also located in southwest Mali and covers a license area of 674 square kilometres. The individual licenses border the Morila gold mine to the north, operated by Barrick Gold and AngloGold Ashanti, from which over six million ounces of gold have been recovered since 2000. To date, Mali has drilled over 35,000 meters of lithium on Massigui and identified three gold deposits, all within a radius of 25 kilometers around Morila. The management assumes that at least eight million tonnes of rock with an average of 1.5g/t gold, i.e. about 400,000 ounces of gold, can be extracted from these three deposits in open pit operation. In addition, the license area has an incomparably higher potential for further resources. The Morila Mine has few resources left and will only be able to survive for a few years from its own deposits. In November 2016 an option agreement was concluded with Randgold (now Barrick Gold). Accordingly, the Randgold subsidiary Societe de Mines De Morila paid Mali Lithium AU\$ 1 million, with the company retaining an additional 4% royalty. From September 2018 to August 2019 alone, this generated around AU\$ 4.5 million in revenues for Mali Lithium. The Company is therefore planning new drilling activities from mid-October 2019 to develop potential additional gold resources and benefit from the recent increase in gold prices.

Transformed management team with maker qualities

Since 2018, the Birimian management has been almost completely replaced. Three new managers stand out in particular.

Chris Evans joined Birimian Limited as Managing Director in February 2019. He is an experienced project and operations

management expert who most recently served as Chief Operating Officer of Altura Mining. During his tenure, Altura changed from exploration to production to export and expanded from a handful of employees to over a hundred. Evans was also involved in establishing and maintaining important relationships with project financing and acceptance partners. CEO Mark Hepburn comes from Corporate and Financial Markets with over 28 years experience in a number of management and board positions in institutional stockbroking and derivatives trading for large financial institutions. He has also been involved in numerous capital raising transactions for ASX listed industrial and commodity companies. In February 2019, Alistair Cowden was appointed Non-Executive Chairman of Birimian. Cowden has been a Managing Director, Director and Geologist in the mining industry in Australia, Africa, Asia and Europe for more than 35 years. He has founded eight public limited companies, including Altona Mining, of which he was Managing Director. Altona financed the construction and sale of the Kylylahti copper-gold mine in Finland in 2014 and owned the Eva Copper project in Queensland before merging with Copper Mountain for \$250 million.

Exclusive interview with Chris Evans, Managing Director of Mali Lithium

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

It has been a very exciting year for Mali Lithium as we have achieved a number of very significant milestones on our Goulamina Lithium Project in Mali, West Africa.

These include:

- ▶ Being Granted our Environmental and Mining (Exploitation) permit from the

Summary: Full speed ahead to one of the world's highest grade and possibly most economical lithium mines

Mali Lithium was one of the very few development companies to seize the opportunity to secure a lithium deposit on the African continent.

The Company is benefiting from previous tests that clearly demonstrate that Goulamina hosts a high grade and high-quality lithium resource, which has been confirmed by its own drilling within a very short period of time. If you take a closer look at the facts and parameters known so far, including reserves, resources and pre-feasibility study, you will quickly come to the conclusion that Goulamina is one of the few absolute hits in the lithium range. Good infrastructure, high grades and the possibility of cost-effective surface mining, this is exactly what investors are looking for in lithium projects! In addition, it is possible to generate positive cash flow with the Massigui Gold project. The new management team has shown in the past that it can firstly raise sufficient capital for medium-sized mining projects and secondly put them into practice. Mali Lithium recently completed a financing of AU\$ 5.3 million.

Malian Government, making us fully permitted

- ▶ Achieving excellent metallurgical testwork results by achieving >80% recovery of Lithium which is a significant improvement on the Pre-Feasibility Study (PFS) test work
- ▶ Optimising the project infrastructure in terms of power, roads and water as part of the Definitive Feasibility Study (DFS)

- ▶ Advancing our relationship with China Minmetals who are the largest Mining Company in China and are now conducting testwork on our ore in China.

In addition to our Lithium project we conducted a review on our highly prospective Gold tenements in Southern Mali and have announced an upcoming drilling program to realise some short-term shareholder value while Gold prices are high.

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

The completion and release to the market of our DFS in Q1 2020 will be the next most important milestone for the Goulamina Lithium Project and indeed the Company. The publication of this report will again show the market what a world class project we have, and it will compile all of the technical work done to date and significantly de-risk the project for potential investors.

ISIN: AU0000049918
WKN: A2PMWQ
FRA: N9F
ASX: MLL

Outstanding shares: 264.5 million
Options: 9.5 million
Warrants: -
Fully diluted: 274.0 million

Contact:

Mali Lithium
Unit 18, Second Floor, Spectrum Building
100 - 104 Railway Road, Subiaco, WA 6008

phone: (08) 6149 6100
info@malilithium.com
www.malilithium.com

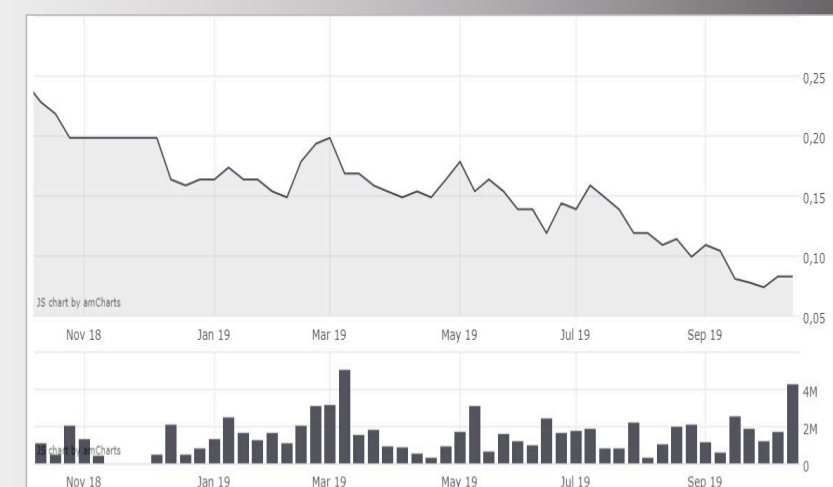
We will then be in a position to engage off take and funding partners and make a final investment decision in the second half of 2020.

In addition to this we look forward to commencing a drill program on both our Gold and Lithium tenements in October 2019 and publishing the results to the market as they become available. Mali Lithium has previously generated approximately AUD \$4.5M in royalties from our Gold tenements in the same region as we are about to drill so there is a very exciting few months ahead for the Company.

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

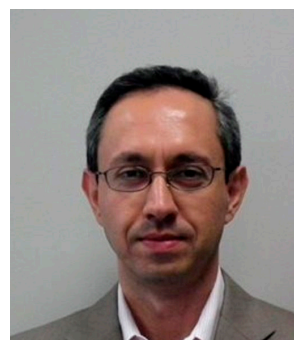
It has certainly been a tough market over the past 12 months for Battery metals in general and Lithium in particular. I see an improvement in Lithium market sentiment coming in 2020 which will increase opportunities for Mali Lithium to seek strategic partners and investors on the back of releasing our DFS.

Mali Lithium



Millennial Lithium

Excellent feasibility study complete, pilot production about to start



Farhad Abasov, CEO

Millennial Lithium is a Canadian development company focusing on lithium projects in Argentina. The company is in pole position in this respect, as it has already been able to present a completed feasibility study. A pilot production plant including an extended evaporation basin is currently under construction.

Pastos Grandes Lithium Project – Location and Acquisition

The flagship project is Pastos Grandes, a lithium project in the northwestern Argentine province of Salta. Pastos Grandes is a salt lake that is part of a series of similar lakes that run like a string of pearls through the provinces of Salta and Catamarca.

Millennial Lithium's Pastos Grandes Project consists of several sub-areas, which currently cover 8,664 hectares and have been gradually acquired since around mid-2016. The Company initially carried out geophysical work, a comprehensive drilling program, resource estimation and construction of evaporation ponds, a mini processing facility and a camp. Furthermore, a hybrid solar power supply system was put into operation.

Pastos Grandes Lithium Project – Very good connection to the existing infrastructure

The biggest plus point is the relative proximity to the provincial capital Salta. While most of its competitors' projects are literally located in the Pampa, Millennial Lithium's project has a direct connection to the city of Salta, which is about 235 kilometres away by road and has about 350,000 inhabitants. At the same time, Salta is the capital of the province of the same name in the very northwest of Argentina. At the same time, there is a direct, approximately 490 km long road

connection to the Chilean port of Antofagasta, which not only has a Pacific deep-sea port, but is also one of the leading mining cities in South America. A 600-megawatt, 375 kilovolt high-voltage line connecting Salta and Mejillones in Chile runs 53 kilometers north of the project area. A natural gas pipeline runs about 26 kilometers northwest of the project.

Pastos Grandes Lithium Project – Exploration and Development Successes

In autumn 2016 Millennial Lithium started its first own drilling campaign on Pastos Grandes. The first well (up to 192 metres deep) already encountered three layers of water-bearing brine of different depths, with densities of 1.19 g/cm³ to 1.22 g/cm³. The second well (up to 352 metres deep) even encountered eight intervals, each about one metre long. These drilling successes led the company to drill a further third well. In total, lithium contents of up to 471 mg/L could be detected by means of these boreholes.

In June 2017, Millennial Lithium discovered an average lithium content of 535 mg/L over 381.5 meters by drilling another well.

A subsequent pump test carried out in another borehole yielded average lithium contents of around 430 mg/L over a period of 60 hours. In addition, the lithium content was slightly reduced from only 439 to 431 mg/L over the entire test period.

In August 2017, Millennial Lithium was able to demonstrate that the brine-bearing layer also continues outside the Salar Center. Among other things, a near-surface layer of 33 metres with an average of 523 mg/L and a deeper layer of 545 mg/L over 211.3 metres were encountered!

An additional well in 2018 returned up to 701 mg/L lithium within a 545-meter-thick section. In November 2018, a 236-meter-long section with an average lithium content of 566 mg/L was also discovered. New pump tests showed lithium contents between 482 mg/L and 518 mg/L over a period of 24 days.

In January 2019 Millennial Lithium was able to confirm in the laboratory that a battery-capable lithium carbonate concentrate of 99.92% can be produced using brine from Pastos Grandes.

Pastos Grandes Lithium Project – Latest resource estimate 100% higher than before

In April 2019, Millennial Lithium published an updated resource estimate for Pastos Grandes based on the Canadian resource calculation standard NI43-101. Accordingly, the project has 4,120,000 tons of lithium carbonate (Li₂CO₃) equivalent (LCE) and 15,342,000 tons of potash (KCl) equivalent in the categories measured and indicated, with an additional 798,000 tons of LCE and 2,973,000 tons of KCl in the inferred category. Compared to the December 22, 2017 resource estimates, the updated resources represent an almost 100% increase in measured and indicated LCE tonnage (2017 value of 2,131,000 tonnes LCE). This provides the Company with significant measured and indicated lithium resources that have the potential to be converted into reserves.

Pastos Grandes Lithium Project – Positive Feasibility Study and Approval Procedure

Based on this resource estimate, Millennial Lithium published a positive feasibility study for Pastos Grandes in July 2019. Accordingly, the project has a Net Pre-

sent Value (NPV) of US\$1.03 billion (discounted at 8%), assuming an average production of 24,000 tonnes of battery grade lithium carbonate per year (>99.5% LCE). Operating costs were estimated at a low US\$ 3,388 per tonne of lithium carbonate over the entire mine life of 40 years. The initial cost of capital amounts to US\$ 448.2 million. The repayment period is 5.4 years. On this basis, the internal rate of return (IRR) is a very strong 24.2% after tax.

The cost of capital includes indirect costs and a total buffer of around US\$ 96.6 million, which may be reduced.

In June 2019, Millennial Lithium submitted the environmental impact assessment for the construction and operation of the Pastos Grandes project to the relevant authorities.

In October 2019, Millennial Lithium announced that the National Mining Secretary of Argentina, part of the National Ministry of Work and Production, has signed and issued a Federal Fiscal Stability Certificate for the company's Pastos Grandes project. The certificate describes the tax system and additional benefits granted to the Pastos Grandes lithium project in the province of Salta for the next 30 years.

Cauchari East Lithium Project

At the end of September 2016, Millennial Lithium announced that it would acquire another lithium project called Cauchari East. This covers 2,990 hectares and is located on the eastern side of the Cauchari-Olaroz Salar, adjacent to Orocobre's producing Salar de Olaroz and Lithium Americas Corp.'s advanced Cauchari-Olaroz project. Millennial Lithium's new project has the same geological characteristics as the two producing or highly advanced projects of adjacent competitors and particularly high potential in the lower salar layers. Studies car-

ried out by Orocobre on their own project suggest that the corresponding lithium brine resources extend to the eastern part of the Salar and thus also to the Cauchari East project. Millennial Lithium has now been able to confirm this by means of geophysical studies.

In June 2017, Millennial Lithium expanded its Cauchari East project by a further 8,742 hectares.

In June 2018, the Company received the long-awaited environmental permit to drill up to 6 wells.

Top management for rapid project development

A top management team was put together for the rapid further development of the company's own projects.

During his career, CEO Farhad Abasov has led Allana Potash to a \$170 million acquisition by Israel Chemical Ltd. and Energy Metals to a \$1.8 billion acquisition by Uranium One, among others. In addition, he was co-founder of Potash One, which was taken over by the German K+S for 430 million dollars in 2010. Chairman Graham Harris was Senior Vice President and Director of the Canadian investment house Canaccord for five years. He raised more than \$250 million in capital for listed and private com-

panies. Harris is also the owner of Sunrise Drilling, which is a decisive advantage for exploration.

Peter Ehren is a specialist for evaporators when it comes to the production of lithium. He has already worked for several big names in the industry (SQM, BHP) and was jointly responsible for the design and construction of the evaporation ponds on Orocobres Salar de Olaroz project.

Summary: Full speed ahead towards production

Millennial Lithium has what other lithium developers can only dream of all their life: A high grade lithium resource, excellent drilling and pumping results, a very good infrastructure (unlike many competitors) and a positive feasibility study. The next important step is the commissioning of the pilot plant, which is imminent. In addition, the company is working on engineering studies and the approval process. The company is still in a top financial position so that all upcoming programs can be implemented without any problems. Millennial Lithium is an exemplary example of how it can and should work in the lithium sector.

Exclusive interview with Farhad Abasov, CEO of Millennial Lithium

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

Millennial has had significant achievements over the past 12 months. The Company built 32,500 m2 of pilot ponds with a liming plant, an infrastructure net-

work at site with a 50-man camp and a solar hybrid power generation system. We have also increased our 43-101 compliant lithium resource to 4.12M tonnes of Measured and Indicated LCE. Most importantly, the Company completed a comprehensive Feasibility Study by WorleyPar-

sons with robust project economic indicators such as an NPV(8) of \$1,030M and IRR of 24.2% and CAPEX of \$448.2M and OPEX of \$3,388/T LCE. Lastly, we are completing the construction of a 3 tonne-per-month pilot plant. In addition, the Company completed a thorough Environmental Impact Assessment (EIA) for the project construction and operation which is going through the approval process.

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

The important catalysts for the Company in the next 6-12 months include the completion of the pilot plant and the production of battery grade LCE for trial test-work by potential customers, securing an offtake agreement for our product, approval of the EIA to allow for the initiation of early works projects on site and detailed engineering, and the completion of project financing. We have a very strong cash position which will allow us to complete these programs.

ISIN: CA60040W1059
WKN: A2AMUE
FRA: A3N1
OTCQX: ATWGF
TSXV: ML

Shares outstanding: 82.6 million
Options/RSUs: 10.1 million
Warrants: 7.5 million
Fully diluted: 100.3 million

Contact:
Millennial Lithium Corp.
Suite 2000 - 1177 West Hastings Street
Vancouver, BC Canada V6E 2K3
phone: +1 604-662-8184
fax: +1 604-602-1606

info@millenniallithium.com
www.millenniallithium.com

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

Millennial remains bullish on lithium demand as car manufacturers remain committed to expansion of their EV fleets globally. As expected, some projects have been delayed or cancelled due to short term fluctuations in lithium pricing but Millennial continues to see a supply shortage by 2025 and a recovery in lithium prices. We also believe that lithium prices will stabilize in 2020-22, that is by the time we hit production and ramp it up.

Millennial Lithium Corp.



Neo Lithium

99.1% lithium carbonate from the first production batch, a sensational value!



Waldo Perez, CEO

Neo Lithium is a Canadian mining development company that has secured one of the world's largest lithium deposits within the so-called „Lithium Triangle“ in Argentina. The special thing about it is that the lithium resource there is growing - day by day! The most recent resource estimate has returned a very high-grade resource that is just below surface. A recently published pre-feasibility study impressively illustrated the world-class status of the flagship project Tres Quebradas.

3Q Project – Location and Infrastructure

Neo Lithium's flagship project Tres Quebradas (3Q) is located in the Argentine province of Catamarca, about 30 kilometers from the Chilean border. The nearest town is about 100 kilometres to the east. The nearest motorway to the project is the Ruta Nacional 60, which connects the capital Catamarca (San Fernando del Valle de Catamarca) with Copiapó and the port of Caldera via the Paso de San Francisco. The project can be reached by motorway over a distance of 60 kilometres in all weathers. By September 2018, over US\$25 million had been invested in the 3Q project, including a 100-person camp. Discovered in December 2015 by the company's founders, 3Q is already fully equipped, including a camp, weather station, geochemical analysis laboratory, solar and diesel power plants, and a wastewater-free sewer system.

3Q Project – Deposit is growing every day

The 3Q project covers about 350 square kilometers, Neo Lithium has a 100% share. The project is located at about 4,000 metres above sea level and con-

sists of a complex of three brine reservoirs and three salars. This is a brine lake, of which only one more is known worldwide. It is located in China and houses a lithium mine. What is special about this is that geothermal sources feed the northern part of the project. These contain high-quality lithium and feed the lakes and salars with about 3,000 tons of lithium carbonate equivalent per year. Isotope and mass balance studies show that the lithium mineral deposit is still being formed by evaporation from the lakes.

3Q Project – Great Resource, High Grade

With over 10,000 metres of drilling and further geophysical surveys, the company has already produced a hydro-stratigraphic model of the salar. In addition, a resource estimate was published in 2018 that impressively underscored the world-class nature of the 3Q project. The Salar contains a total of at least 4,000,000 tons of lithium carbonate equivalent, with high average grades of 614mg/L in the measured and indicated category. The ratio of magnesium to lithium is very good, since it is low at 3.3. A further 3,000,000 tonnes of lithium carbonate equivalent are added in the inferred category. The average grade is 584mg/L and the ratio of magnesium to lithium is 4.5. The cut-off grade is 400mg/L. In the northern part of the salar, an even higher-grade resource was also found. This contains at least 746,000 tons of lithium carbonate equivalent at an average of 1,007mg/L in the measured and indicated categories and 186,000 tons of lithium carbonate equivalent at 1,240mg/L in the inferred category. The ratio of magnesium to lithium is only around 1.7. The cut-off grade was 800mg/L. The reserves were stated at 1,300,000 tonnes of lithium

carbonate equivalent at an average of 794mg/L in mid-2019. The interesting thing about this is that while the southern area was drilled to a depth of 600 metres, the northern, higher-grade area only advanced to depths of 100 metres. Among them is thus still a high Blue-Sky potential. More than 50% of the total resource lies within an area from surface to a maximum depth of 100 metres. 33% lie in deeper sediment layers and have not yet been completely delineated. 3Q is thus currently the fifth largest brine project in the world, and the only project with low critical impurities that is not in production. It is also the sixth highest grade project in the world (based on a 400mg/L lithium cut-off), with the higher-grade area north of the Salar being the second highest of all brine projects in the world.

In April 2019, Neo Lithium was able to study the high-grade resource below a depth of 100 meters for the first time. An average of 1,128mg/L lithium was found in a 137.6-meter-long section. The borehole advanced to a depth of 160 meters. In addition, during a 20-day pump test a stable lithium delivery between 773 and 787mg/L could be proven.

In June 2019, Neo Lithium was able to detect an average of 1,117 mg/L lithium and 11,319 mg/L potash in another well over 178 metres. The sensation: The hole is located on the eastern edge of Lake 3Q, an area where the reserve estimate has assumed that brine is only present to a depth of 10 metres, but the hole meets brine to a depth of 265 metres.

3Q Project – Pre-Feasibility Study + Approval Procedure

In March 2019, the Company published a Pre-Feasibility Study (PFS). An after-tax capital value (NPV, discounted at 8%) of US\$ 1.14 billion was calculated.

After-tax profitability (IRR) is an excellent 49.9%. Capital costs were estimated at US\$ 318.9 million and operating cash costs at US\$ 2,914 per ton lithium carbonate equivalent. This would place 3Q in the range of the world's most cost-effective lithium mines. Over a period of 35 years, 20,000 tons of lithium carbonate could be produced annually. According to this estimate, the repayment period is 1 year and 8 months. Compared to the first profitability study, capital costs were reduced, and profitability increased from 27.9% to 49.9%. Even if the production is now set smaller, this means a much better economy than previously assumed.

In April 2019, after more than two years of preparation, the company submitted the Environmental Impact Assessment (EIA) for an annual production of 20,000 tons of lithium carbonate to the responsible authorities.

3Q project – pilot production, pilot plant

A complete pilot plant on a scale of 1:1,200 has been in operation for more than two years. For about a year now, Neo Lithium has been able to achieve a concentration of 3.8% lithium in the brine without the addition of additives. This makes 3Q the only project in the world that can achieve a lithium concentration of 3.8% without the addition of additives and only by means of natural evaporation. The existing brine is rich in calcium and calcium chloride naturally precipitates with 6 water molecules, reducing the size of the ponds calculated in the PEA. In 2018, a pilot plant for the annual production of 50 tons of lithium carbonate was built and installed on the project site in February 2019. The plant, designed and built by the Instituto de Investigaciones Tecnológicas of the University of Concepcion, Chile, was previously suc-

cessfully tested with synthetic brine in Chile and is now fed with brine from the 3Q project, which concentrates about 4% lithium from the evaporation ponds of the 3Q project to start production of lithium carbonate on a pilot scale in the plant. Currently, the planned annual capacity of the pilot ponds is over 500 tonnes of approximately 4% lithium brine per year, with a planned capacity of 50 tonnes lithium carbonate per year.

In September 2019, Neo Lithium was able to announce that the first batch from its pilot plant had already achieved a lithium carbonate concentration of 99.1%.

The company also reported that the City of Fiambalá had approved the granting of 610 hectares of land for the development of the Fiambalá Industrial Park. The permit covers a 349-hectare portion of the land that will be awarded to Liex S.A., a wholly owned subsidiary of Neo Lithium in Argentina, for the future construction of the company's large-scale lithium carbonate plant.

Top management team

Neo Lithium has a top management team from which President & CEO Waldo Perez stands out once again.

Dr. Perez has more than 28 years of academic and industrial experience in mineral exploration in South America. He was founder and technical director of the Cauchari project acquired by Lithium Americas Corp. and its president and CEO from inception to final feasibility study. Previously, he was CEO of Latin American Minerals Inc, Senior Geologist for Barrick Gold, IAMGOLD, Apex Geoscience and Opawica Exploration.

Stable shareholder structure, sufficient cash

Neo Lithium has a stable shareholder structure. About 45% of all outstanding shares are in the hands of institutional

investors such as BlackRock, Sprott, JPMorgan and Mackenzie. About 16% of the shares are held by insiders. Neo Lithium has about 40 million CA\$ in cash and has no debts.

Summary: Top project with seven-league boots towards production

The 3Q project is an active lithium deposit that is still in the process of formation, with the content and size of the deposit still increasing daily today – almost unique in the world. Furthermore, the company is in negotiations with strategic groups to advance the project. These negotiations have been ongoing for some time and should continue to intensify with the recent completion of the pre-feasibility study, which takes further risks from the project and has shown even better results than the previous feasibility study. The pre-feasibility study clearly confirmed that the 3Q project is one of the best, highest grade and most cost-effective lithium brine projects in the world. The final building permit process has now begun and is expected to be granted in 2019. For the first half of 2020, Neo Lithium plans to complete a definitive feasibility study and then to build the processing facilities by 2021. The ramp-up phase is expected to start as early as the third quarter of 2020, so that the first production is expected at the end of 2021. The management has already proven in the past that it can bring lithium brine projects into production within the self-imposed schedule.

Exclusive interview with Waldo Perez, CEO of Neo Lithium Corp.

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

In the past 12 months the company increased the lithium resources in 220%, defined a lithium reserve enough to sustain production of 20,000 of lithium carbonate battery grade for 35 years and completed a pre-feasibility study that proved that the project is worth US\$1.2 billion and has a IRR of 49% with a payback in less than 2 years. CAPEX for this project would be US\$320 million and it has a very low operating cost of \$2,912 per tonne of lithium carbonate.

We have also announced several key technical milestones by producing lithium carbonate from our pilot plant as well as important production processing advancements.

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

There are several important catalysts over the next few months: obtaining battery grade lithium from our pilot plant, obtaining our final EIA permit, comple-

ting the final feasibility study, and closing a partnership agreement with a strategic partner that will allow us to build the 3Q Project

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

There is an oversupply of expensive and low quality (technical grade) lithium carbonate coming from spodumene producers in Australia that sell their product to processors in China. Their combined operational cost is very high (US\$9,000) and approximately 50% of current supply is now uneconomic at current prices. Many expensive producers have already started to restructure, and other current producers have curtailed expansions or have simply stopped producing. All these issues do not affect us because our operation cost will be significantly less than the Australian/China cost. When the least efficient operations are out of business there is going to be a focus on low cost producers. We believe we are well positioned to take advantage of this situation.

ISIN: CA64047A1084

WKN: A2AP37

FRA: NE2

TSXV: NLC

Shares outstanding: 117.5 million

Options/warrants: 11.3 million

Fully diluted: 128.8 million

Contact:

Neo Lithium Corp.

01 Bay Street, Suite 2702

Toronto, Ontario, M5H 2Y4, Canada

phone: +1-416-962-3300

info@neolithium.ca

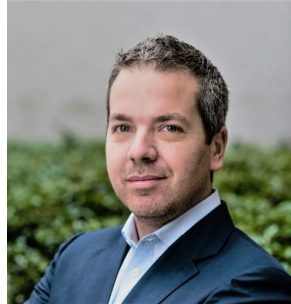
www.neolithium.ca

Neo Lithium Corp.



Plateau Energy Metals

One of the largest hard rock lithium projects with high grades and open pit capability



Alex Holmes, CEO

Plateau Energy Metals is a Canadian mining development company focused on the research and development of the Falchani lithium project and the Macusani uranium project in southeastern Peru. The Company, which has 100% control of mineral concessions covering more than 93,000 hectares, has one of the world's largest hard rock lithium resources and all known Peruvian uranium resources close to its well-developed infrastructure.

Flagship project Falchani – Location and infrastructure

Plateau Energy Metals' entire contiguous project area is located in southeast Peru, approximately 150 kilometers southeast of Cusco and 200 kilometers north of Lake Titicaca. Highway 34B runs through the project area. The San Gaban hydro-power plant is located 20 kilometres to the northeast. In addition, there are several running mines within a radius of 50 kilometres. The town of Macusani, with a population of around 12,000, is only 8 kilometres from Plateau Energy Metals' project site. Direct access to the Pacific deep-sea ports of Ilo, Mollendo and Matarani is by road and later by rail. The flagship lithium project Falchani is a small, relatively central part of the concession area.

Flagship project Falchani – Geology and drilling successes to date

Falchani is a large, high-quality hard rock lithium deposit within a volcanically stored solid brine. The confirmed finds to date all originate from depths of up to 350 metres, with many drill sections already containing significant lithium contents from the surface. The contents determined were almost continuously abo-

ve 2,000 parts per million (ppm) lithium, which is extremely unusual for a hard rock lithium deposit near the surface. One of the previous highlights was certainly a 338-meter-long section with an average of 2,895ppm lithium, which started directly below the surface.

Flagship project Falchani – Resource

In March 2019, Plateau Energy Metals released an updated resource estimate that increased the previous resource by more than 90 percent. A total of 60.9 million tonnes of rock with an average of 2,954ppm lithium for 0.96 million tonnes of Li_2CO_3 (lithium carbonate) equivalent were outlined in the indicated category and 260.1 million tonnes of rock with an average of 2,706ppm lithium for 3.75 million tonnes of Li_2CO_3 equivalent in the inferred category. In the high-grade lithium rich tuff rock alone, 42.5 million tons of rock with an average of 3,500ppm lithium for 0.79 million tons Li_2CO_3 equivalent could be outlined in the category indicated and 123.6 million tons of rock with an average of 3,243ppm lithium for 2.13 million tons Li_2CO_3 equivalent in the inferred category. This means that Falchani is currently home to the sixth largest lithium resource in the world.

Flagship project Falchani – Resource potential

Although Falchani already has a very high resource, to date only 30% of the project area has been investigated for lithium deposits. The current focus is on a 2.2 by 1.7-kilometre area that has already been mapped and sampled. While the entire Indicated Resource is located east of a valley, an area known as Falchani East, part of the Inferred Resource is located west of the valley in an area

named Falchani West. No drilling has been done to date in the northwestern area of Falchani West, but this is expected to happen soon. When taking samples, however, extremely high lithium contents of up to 4,272ppm were found. In addition, another target area called Tres Hermanas could be identified further west. There, up to 3,452ppm lithium could be detected by taking samples. Tres Hermanas is a total of three ridges of protruding lithium-rich tuff, which are interpreted as inclined upright compared to relatively horizontal for Falchani. Each ridge is about 80 meters high and at least 750 meters long, running east-west. Plateau Energy Metals is currently working on extensive trench work to determine the potential of Tres Hermanas.

During further work, about 6 kilometres west of the Falchani deposit, another hot trace was discovered. For example, up to 2,986ppm of lithium could be determined during sampling in the new Quelcaya target area.

Meanwhile, the exploration of Falchani is concentrated on an area of about 6 by 5 kilometres around Falchani, which is a former, meanwhile collapsed caldera. During additional discovery tours outside this area, lithium-rich tuff quarries containing up to 5,100ppm of lithium were discovered 20 kilometres west of the Falchani deposit.

Flagship project Falchani – Top metallurgy + profitability study

Plateau Energy Metals has already conducted extensive metallurgical testing on Falchani mined rock. In the case of tank leaching, the recovery rate was between 77 and 81% and the purity 99.74%. In the case of sulfation baking, a recovery rate of 72 to 82% and a purity of 99.82% could even be achieved. This enabled the company to demonstrate that lithium

from Falchani can be used to achieve a battery-compatible purity of over 99.50%. From the management's point of view, an increase in purity would be possible through additional refining on site. In addition, the extent to which existing potash and additional metals can be mined and processed is being investigated. After all, Peru is a net importer of potash, which would give it a potential local customer.

The company is currently working on a feasibility study (PEA) that will provide further information on the economic viability of Falchani.

Macusani Uranium Project

The Macusani Uranium Project is located northeast of Falchani and consists of two project areas. In total, Macusani has at least 10 individual near-surface uranium occurrences. The current resource base consists of 52.9 million pounds U3O8 in the Measured and Indicated category plus 72.1 million pounds U3O8 in the Inferred category. An economic analysis that incorporates the resources of only 5 out of 10 deposits and is based on an annual production of 6 million pounds of U3O8, yields a net present value (NPV) of US\$603 million for US\$50 per pound of uranium. A total of 70 million pounds of U3O8 could be produced over the entire mine life of 10 years. The after-tax profitability (IRR) is a very good 40.6%. Operating costs were estimated at US\$ 17.27 per pound U3O8 and initial capital costs at US\$ 299.8 million. The repayment period in this case is 1.76 years. The break even was estimated at US\$ 25.66 per pound of uranium, which is why Macusani could easily be mined at uranium prices around US\$ 35. In this case, the NPV was calculated at US\$235 million, at a price of US\$65 per pound of uranium, it would increase to US\$965 million. In total, the Macusani Uranium Project

has 47 targets that offer the potential for additional high-grade resources. Especially since 85% of the project area has not yet been drilled.

Experienced and successful management

Plateau Energy Metals has a very experienced and successful management team.

CEO Alex Holmes has worked in the mining industry for more than 15 years. Prior to joining Plateau Energy Metals, he led the development of True Gold's Karma Mine from preliminary economic evaluation to feasibility study to gold production in early 2016, during which time Holmes and his team raised more than \$215 million to help build and operate True Gold's Karma Mine.

Among others, he did this with Director Christian Milau, who also held senior positions at Endeavour Mining Corp., New Gold Inc. and in investment banking at BNP Paribas in London.

Summary: Economic feasibility study and drilling results ahead

Plateau Energy Metals has one of the largest hard rock lithium deposits in the world with the Falchani Lithium Project. Not only does the project have extremely high-grade resources, but it also has the advantage that they are very shallow, potentially making the deposit(s) exploitable through open pit operation. The economic indicators should therefore be correspondingly positive. The economic feasibility study will provide more detailed information on this.

In addition, there is the Macusani uranium project, which is already in pre-feasibility and has very good economics in the event of a rising uranium price. Macusani, like Falchani, has a high potential for additional resources. In addition to the economic feasibility study at Falchani, future drilling results should therefore also be an important catalyst.

Financing is secured for the time being. After all, in September 2019, the company was able to finance a total of 1.5 million CA\$.

of the cost curve, and via a phased expansion plan become one of the largest lithium carbonate producers in the space. We will evaluate potential for lithium hydroxide at site as well, with some additional work, and potential for the other revenue streams such as fertilizer (SOP). Peru is a net importer of SOP, giving us a strategic location advantage.

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

The current sentiment of battery metals equities is weak, and I believe we are working through stockpiles. It is noise in the early days for batteries, the train has clearly left the station and countries are waking up to the fact lithium is the new oil and China controls it (currently). Technological advancements and economies of scale mean batteries cost 10% of what they did 9 years ago – this enables mass market EV adoption and cost effective off-grid energy storage systems. Medium and long-term outlook remains strong, and on the back of faltering

spodumene concentrate projects and delayed expansion plans, I believe the supply deficit has been brought forward a couple of years. Projects that can produce a battery grade product, are scalable, in the lower half of the cost curve and in mining responsible jurisdictions, I think, will survive and thrive.

Exclusive interview with Alex Holmes, CEO of Plateau Energy Metals

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

We discovered our Falchani Lithium Project in Peru in late 2017, published a maiden resource in July 2018, only to nearly double it 6 months later. It is the 6th largest hard rock lithium project in the world today.

Along the way we made three new lithium discoveries – one adjacent to the existing deposit, one six kilometers west and another 20 kilometers west. We completed an 18-month, two phase metallurgical work program and trade-off

studies demonstrating viable processing routes using conventional techniques resulting in a high purity battery grade lithium carbonate (99.74% & 99.82%). Our PEA is well advanced.

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

Completion of the PEA to demonstrate Falchani can be an open pit mine, scalable lithium project with the ability to produce a battery grade product at site, expected to be positioned in the lower half

ISIN: CA72764B1004
WKN: A2JGKQ
FRA: QG1A
TSXV: PLU

Shares outstanding: 85.5 million
Options: 7.8 million
Warrants: 8.1 million
Fully diluted: 101.4 million

Contact:

Plateau Energy Metals
141 Adelaide St. W., Suite 340
Toronto, Ontario, M5H 3L5 Canada

phone: +1-416-628-9600

IR@PlateauEnergyMetals.com
www.plateauenergymetals.com

Plateau Energy Metals

