Battery Metals Index

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Battery Metal Stocks Continue Their Surge as Congo Rides a Red Line

While automakers worldwide are racing to produce electric vehicles (EVs), battery metals continue to climb as both lithium and cobalt see ever-increasing demand. The forecasted under-supply of battery metals is further complicated by conflict-ridden Congo, which supplies nearly half of the world's cobalt, as it has recently been under scrutiny for inhumane working conditions and employing child labour. The Ubika Battery Metals Index, composed of 10 lithium and 10 cobalt companies, has rallied 56% over the past year, with some company valuations surging more than 100%. With an implied shortage of lithium and cobalt in the market, we examine which producing companies are best positioned to rise from this battery frenzy.

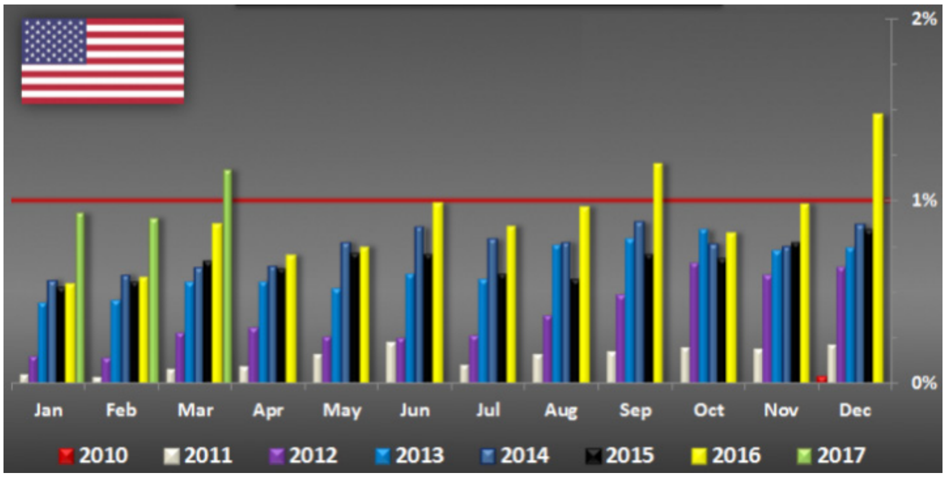
Industry Highlights

- Panasonic has hinted at working on a solid-state lithium battery, which uses a solid electrolyte instead of the liquid electrolyte in its 18650 lithium-ion battery cell used in the Tesla Model S and X. Theoretically, solid-state batteries could have twice the energy density of current batteries and have a lifetime of several times that of a regular Li-ion battery. Limited range and slow charging times have been barriers for the adoption of electric vehicles, however a solid-state battery can change all that. Additionally, Panasonic is exploring the usage of a non-flammable electrolyte such as glass, polymer or a hybrid of the two, which would eliminate safety issues associated with Li-ion cells.

- Spot prices for Cobalt have been on an upward trajectory since the start of 2017, surging 66% from US$15.50/lb to over US$25/lb today. Demand for the metal is expected to proliferate with the acceleration of Tesla's Model 3 production and other EVs, as well as demand for energy storage solutions. The rally behind Cobalt has been further supported by increasing investor excitement and a fragile supply chain; nearly half of global cobalt supply is produced in the unstable Democratic Republic of Congo (DRC). High-profile funds in Switzerland and China have also been buying physical stocks of cobalt to lure investors, which has triggered panic buying by cobalt users along the manufacturing chain. The near-term shortage of cobalt has created bubble-like conditions, which are likely to dissipate once more supply comes online.

- According to [Inside EV's], Plug-in vehicle sales marked a new milestone as they surpassed the 1% market share for new automobile sales in the USA (Figure 1). Compared to March of last year, U.S. plug-in car sales for March 2017 were up a whopping 89%, netting approximately 18,107 deliveries. In total, there have been more than 600,000 plug-in cars sold in the U.S. since December 2010, and this is expected to increase to 750,000 by the end of this year. First-quarter 2017 results show Tesla Model S continues to be the most popular model, followed by the Chevrolet Volt and the Toyota Prius. With Tesla's Model 3 going into production by the end of this year with over 350k reservations, we can anticipate EVs to double their market share of auto sales by the end of next year.

Figure 1: U.S. Plug-In Car Sales – Market Share



Source: InsideEVs

- Tesla announced the completion of a 55,000 panel solar farm on the Hawaiian island of Kauai that will allow the Company to experiment with medium-term energy storage at a utility scale. The project includes 272 Tesla Powerpacks that are capable of storing 62Mwh of electricity, enough to power nearly half the island 24/7. Kauai has one of the highest electricity rates in the U.S., and the Tesla project will eliminate 1.6 million gallons per year of diesel and petroleum consumption in return for 13.9 cents per Kwh. Companies such as Tesla are racing to service high electricity cost areas with their own solar and Li-ion energy solutions as companies and countries shift away from non-renewable energy.
- Although Tesla's 35GWh capacity Gigafactory 1 has been the center of attention, numerous large-scale Li-ion 'megafactories' are currently being built around the world, many of them in China. Contemporary Amperex Technology Ltd. is building the world's largest megafactory in China with a capacity of 50 GWh by the year 2020. In fact, by 2020, Benchmark Mineral Intelligence estimates China's lithium-ion plants will grow from a capacity of 16.4 GWh today to over 107.5 GWh by 2020. Gigafactory 1 is expected to require over 5,000 tonnes of cobalt and 38,000 tonnes of lithium hydroxide alone. With 3 additional Gigafactories planned by Tesla and additional megafactories currently under construction worldwide, there is a substantial strain on already stretched raw material markets.

Upcoming Events

- Battcon 2017: International Stationary Battery Conference and Trade Show: May 7th-10th, hosted by Battcon at the Renaissance Orlando at Sea World Resort, Florida, U.S.A.
- Lithium Supply and Markets Conference: May 31st-June 1st, hosted by the American Metal Market at the Hyatt Regency Hotel, Montreal, Canada.

Notable Performers

eCobalt Solutions Inc. (TSX:ECS)

eCobalt Solutions Inc. ("eCobalt") is a mineral exploration and development company with properties in Canada, the United States, and Mexico. eCobalt's stock price has more than doubled year to date, as it received financing to develop its primary asset, the Idaho Cobalt Project (ICP), which is the only near-term and fully-permitted primary cobalt deposit in the United States. With the fragile state of the global cobalt supply chain, eCobalt is leveraging its ICP asset as original equipment manufacturers (OEM) shift away from conflict-ridden cobalt supplies from the Democratic Republic of Congo (DRC).

The ICP project consists of 4,080 acres and over 170 mining claims, with a mine, mill, and concentrator on-site. Located in Lemhi County outside the town of Salmon, Idaho, ICP is being awakened from a long-term slumber after being placed on care and maintenance in May 2013, due to depressed financial markets and declining commodity prices. A revised January 2017 technical report highlights measured and indicated mineral resources of 38.5 M lbs of Co at a grade of 0.55% (Figure 2). After gold and copper by-product credits, the cost per pound of cobalt is projected to be US$4.94, implying juicy profits with today's cobalt prices of US$25+/lb. Additionally, the Company has secured $17.25mm in financing to fund the ICP project with initial production in 2018 of 1,500 tonnes annually of high purity cobalt sulfate over a 12.5 year mine life. The project is expected to have a payback period of under 3.7 years with a processing rate of 800 tpd and a post-tax NPV of US$113.5mm. However, it is worth noting that the aforementioned estimates assume a discounted cobalt price of US$19.50/lb and with increased production, it is likely the payback period will be cut down to below 3 years with an NPV of over US$200mm. An updated feasibility study is expected in Q2/2017.

Figure 2: Idaho Cobalt Project Mineral Resources and Reserves

Class	Cutoff (%Co)	tons	%Co	Lbs. Co	%Cu	Lbs. Cu	oz Au/ton	oz Au
Measured	0.20	2,266,000	0.54	24,587,000	0.71	32,123,000	0.016	35,600
Indicated	0.20	1,214,000	0.58	13,996,000	0.82	19,839,000	0.018	22,100
M + I	**0.20**	**3,480,000**	**0.55**	**38,583,000**	**0.75**	**51,962,000**	**0.017**	**57,700**
Inferred	0.20	1,675,000	0.47	15,648,000	0.71	23,753,000	0.013	21,900

Source: Sedar Filing, NI 43-101

Recently, Apple Inc. (NASDAQ:AAPL) announced that it had temporarily stopped buying cobalt mined by hand in Congo, while continuing to deal with problems concerning child labour and unsafe working conditions. Under securities law, companies are required to certify their materials do not come from militia-controlled mines. Apple publishes a publicly-available list of cobalt smelters just as it does for its conflict mineral smelters to ensure its supply chain is ethical and humane. As more and more companies adhere to their corporate responsibility, companies such as eCobalt, which operates outside of the DRC, will benefit from operating in a safe, conflict-free jurisdiction.

Earlier in Q1/2017, eCobalt released a third-party market study that established ICP's cobalt sulfate samples had met nickel-manganese-cobalt (NMC) and nickel-cobalt-aluminum (NCA) battery technologies. With near-term production expected to commence in 2018, it would not be surprising for eCobalt to secure an off-take agreement with an OEM by the end of the year. Currently trading at a price-to-book multiple of 2.1x, eCobalt Solutions Inc. is trading at a premium to its Cobalt Index 10 peers as well as the mining industry average of 0.7x (Figure 3). Although the updated feasibility study will likely increase the net asset value of the IPC project, it will not be enough to justify eCobalt's astronomical valuation.

Figure 3: Cobalt Index 10

Identifier	Company Name	Price Close (CAD)	Market Cap (CAD, mm)	52-week Price PCT Change	Price to Book	Cobalt Resources (million lbs)
ECS.TO	Ecobalt Solutions Inc	1.21	117.8	414.9%	2.1x	27.7
LUN.TO	Lundin Mining Corp	5.52	4,141.7	79.5%	1.3x	24.3
IGO.AX	Independence Group NL	3.62	1,571.0	22.4%	1.2x	
LMI.L	Lonmin PLC	1.30	372.1	-26.1%	0.2x	388.7
KAT.TO	Katanga Mining Ltd	0.35	629.8	214.3%	0.5x	
ALS.TO	Altius Minerals Corp	12.15	395.1	2.2%	1.8x	339.5
S.TO	Sherritt International Corp	0.97	218.7	28.6%	0.3x	35.7
TGS.AX	Tiger Resources Ltd	0.04	72.3	2.1%	0.5x	111
HIG.AX	Highlands Pacific Ltd	0.05	47.0	-4.3%	n/a	25
FT.TO	Fortune Minerals Ltd	0.23	52.3	235.7%	1.1x	69.5

Source: Ubika Research (Cobalt Resources taken from reserve tables and direct contact with company Investor Relations Personnel)

Katanga Mining Ltd. (TSX:KAT)

Katanga Mining Ltd. ("Katanga") is a mining company focused on the exploration, development, and production of its large-scale copper-cobalt property, the Kamoto/Dima mining complex, in the Democratic Republic of Congo. Katanga has been punished in the markets due to underperformance and missed production guidance for its two main mines in the complex: Kamoto (underground) and KOV (open-pit).

In September 2015, Katanga announced an 18-month suspension of operations as the low-price environment for copper no longer made mining feasible. The shutdown reduced Congo's copper production by 15% overnight. As a result, sales levels dropped significantly in Q4/2016 to $4.0mm from $10.8mm in Q4/2015, representing a decreased of over 60%. However, on February 13th, Glencore PLC (LON:GLEN) acquired an 86.33% stake in Katanga Mining, as it plans to turn things around and restart the mining operations in 2018 now that both copper

Figure 4: Katanga's Mineral Assets

Mineral Resource Classification	**Project Area**	**Mt**	**%TCu**	**%TCo**
Measured Resource	KTO UG	12.2	3.9	0.59
	Mashamba East OP	0	0	0
	Mashamba East UG	0	0	0
	T-17 UG	4.2	2.66	0.51
	KOV OP and KTE OP	0	0	0
	Kananga OP	0	0	0
	Tilwezembe OP	0	0	0
	Subtotal	**16.4**	**3.58**	**0.57**
Indicated Resource	KTO UG	65.9	3.92	0.46
	Mashamba East OP	38.1	1.66	0.60
	Mashamba East UG	21.9	1.72	0.67
	T-17 UG	9.4	4.44	0.65
	KOV OP and KTE OP	110.5	4.75	0.53
	Kananga OP	4.1	1.61	0.79
	Tilwezembe OP	9.5	1.89	0.6
	Subtotal	**259.4**	**3.66**	**0.54**
Measured and Indicated Resource	KTO UG	78.1	3.92	0.48
	Mashamba East OP	38.1	1.66	0.60
	Mashamba East UG	21.9	1.72	0.67
	T-17 UG	13.6	3.89	0.61
	KOV OP and KTE OP	110.5	4.75	0.53
	Kananga OP	4.1	1.61	0.79

Source: Sedar Filing, NI 43-101

and cobalt are trading at more attractive forward strips. Katanga fits like a glove in Glencore's portfolio, as Glencore had also recently acquired Mutanda Mining SARL, a high-grade copper and cobalt producer also located in the Lualaba province in the DRC. Mutanda has been consistently processing over 200 ktpa of copper cathodes and 24 ktpa of cobalt in hydroxide, and Katanga will definitely benefit from Mutanda's operational expertise.

On March 31, Katanga Mining released an updated NI 43-101 technical report for its material assets in the DRC (Figure 4). The Kamoto and KOV mines have combined measured and indicated resources of 16.4 Mt of copper and 1.9 Mt of cobalt, enough to give Katanga the potential to be Africa's largest copper producer and the world's largest cobalt production company.

Glencore's interest has brought significant traction to Katanga's stock, as it has more than doubled since the announcement of Glencore's investment. Having said that, Katanga is still trading much lower than its 2007 highs of over $20/share. Looking forward, if Katanga can produce copper and cobalt with conflict-free operations—low cost and ethically humane—as well as synergistically benefit from Glencore's Mutanda asset, Katanga Mining Ltd. is well positioned to become a mid-tier mining company. Currently trading at a P/B multiple of 0.5x, Katanga appears to be undervalued as it is trading well below its Cobalt Bubble Index peer average of 1.0x.

Lithium Americas Corp. (TSX:LAC)

Lithium Americas Corp. ("LA") is a resource company focused on the development of two lithium projects: the Cauchari-Olaroz project in Argentina and the Lithium Nevada project in the U.S. The Cauchari-Olaroz project is a 50/50 joint venture with Sociedad Quimica y Minera de Chile (SQM) and is believed to be the world's third-largest lithium brine resource (Figure 5). Located in the lithium-triangle of Argentina, it is a source of the cheapest and highest-quality lithium brine deposits in the world. Click here for our expert article, where we present the case for Lithium Americas' potential to become the world's lowest-cost lithium producer.

Figure 5: Cauchari-Olaroz Resource and Reserves

	Brine Volume (m^3)	Average Li Concentration (mg/L)	Lithium Metal (t)	LCE (t)
Cauchari-Olaroz (100% basis)				
Mineral Reserves – March 2017				
Proven Reserves (Years 1-5)[1,2,3,4]	4.93×10^7	712	35,159	187,149
Probable Reserves (Years 6-40) [1,2,3,4]	3.54×10^8	695	246,474	1,311,982
Mineral Resources – July 2012				
Measured Resources[2,3,4,5,6]	9.14×10^8	630	576,000	3,039,000
Indicated Resources[2,3,4,5,6]	2.89×10^9	570	1,650,000	8,713,000

Source: Corporate Presentation

The Cauchari-Olaroz project is fully-permitted with construction currently underway. The site benefits from excellent infrastructure, including access to power, water, paved highways, and a deep-sea port (Figure 5). A March 2017 feasibility study supports operating costs of US$2,495/t of battery grade lithium carbonate, generating average annual EBITDA of US$233mm and an pre-tax NPV of US$1,266mm. However, it is worth noting that these estimations utilize a very conservative lithium carbonate price of US$12,000/t and a discount rate of 10%, compared to forward projections of lithium reaching as high as $20,000/t by 2021 and the mining industry average discount rate of 8%. Additionally, an upcoming feasibility study for the Cauchari-Olaroz project is expected to double production capacity to 50,000 tpa over a two-stage mine plan, which is expected to drastically increase the NPV and reduce the payback period of the project.

Figure 6: Location of the Cauchari-Olaroz Lithium Project

Source: Corporate Presentation

As for the Lithium Nevada project, an upcoming Pre-Feasibility Study (PFS) is expected to be released in 1H/2017, which is likely to boost the stock. The Company is advancing the Nevada project with a new highly-skilled technical team that is focused on producing lithium hydroxide from clay. A Subsidiary of LA is RheoMinerals Inc., which manufactures lubrication products from clay that is used in oil and gas exploration as well as animal feed and industrial coatings. RheoMinerals is another value that entails further upside into shares of Lithium Americas.

Looking ahead, Lithium Americas has secured US$286mm in debt and equity financing (at $0.85/share) and expects Stage 1 production of 25 ktpa by early 2019 at Cauchari-Olaroz. Currently trading at a P/B multiple of 4.4x, Lithium Americas is trading at a premium to its Lithium 10 Index peer average of 3.7x. The valuation for the index and stock itself seems superfluous considering the mining industry P/B average of 0.7x. Nonetheless, the future of Lithium Americas Corp. seems bright as lithium carbonate prices continue to rise and it employs operational learnings from its Cuachari-Olaroz JV partner SQM—the world's largest lithium brine producer.

Figure 7: Lithium Index 10

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FT.TO	Fortune Minerals Ltd	0.23	52.3	235.7%	1.1x	69.5

Source: Ubika Research

Industry Disruptor: Vanadium

Industry experts are touting Vanadium as the next big wave after lithium batteries to be used as grid, microgrid, and off-grid renewable electricity storage. Although Li-ion batteries have taken the lion's share of the energy storage market, technological advances in flow batteries have brought down costs and improved their safety and environmental profile for utility-scale installations. Compared to lithium-ion batteries, vanadium redox flow batteries (VRB) are non-flammable, environmentally friendly, and have significantly longer lifespans (10,000 cycles) with less decay—maintaining up to 90% of their capacity over two decades.

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