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Lithium and cobalt metals markets booming

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Heavy Rare Earths Oxides (HREO)		Light Rare Earth Oxides (LREO)	Critical Metals and Special Minerals	
europium (Eu)	erbium (Er)	lanthanum (La)	yttrium (Y)	lithium (Li)
gadolinium (Gd)	thulium (Tm)	cerium (Ce)	scandium (Sc)	graphite (C)
terbium (Tb)	ytterbium (Yb)	praseodymium (Pr)	niobium (Nb)	tungsten (W)
dysprosium (Dy)	lutetium (Lu)	neodymium (Nd)	tantalum (Ta)	titanium (Ti)
holmium (Ho)		promethium (Pm)	beryllium (Be)	zirconium (Zr)
		samarium (Sm)	gallium (Ga)	hafnium (Hf)
			indium (In)	antimony (Sb)
			germanium (Ge)	cobalt (Co)

In my **Special Report** published in May, I already anticipated that the cobalt price would benefit from the surging rise of the production of lithium (Li-on) batteries, with approximately 75% of these batteries using cobalt. Cobalt offers the highest energy density of the various Li-on battery formulas, making them very popular in electric vehicles.

Compared to lithium, **cobalt** is a shiny, grey, brittle metal that is best known for creating an intense blue colour in glass and paints. It is not a rare element even though pure cobalt is not found in nature.

Cobalt occurs in conjunction with other elements in such metals as carrollite, a copper-cobalt-(nickel) sulphide; skutterudite, a cobalt-nickel arsenide and asbolane, a nickel-cobalt-manganese oxide.

Cobalt is obtained from the following three main types of ore deposits: (1) Sediment-hosted stratiform copper deposits such as those in the Central African copper belt in the Democratic Republic of Congo (DRC) and Zambia; (2) magmatic nickel sulphide deposits, such as those found at Sudbury Canada and at Norilsk, Russia; and (3) nickel laterite deposits, which are found in such tropical regions as New Caledonia (overseas territory of France).

Cobalt is frequently used in the manufacture of rechargeable batteries and to create alloys that maintain their strength at high temperatures. It is also one of the essential trade elements (or "micro-nutrients") that humans and many other living creatures require for good health.

Cobalt is an important component in many aerospace, defence and medical applications and is a key element in any clean energy technologies.

Globally, the leading use of cobalt as in rechargeable batteries to help increase life and stability and to reduce corrosion, Mobile phones, portable computers and hybrid and electric vehicles all depend on the energy produced by chemical reactions in these rechargeable batteries.



Congo (Kinshasa) is the world's leading source of mined cobalt, supplying more than one-half of world cobalt mine production. With the exemption of production in Morocco and artisanal mined cobalt in Congo (Kinshasa) most cobalt is mined as a by-product of copper and nickel.

In 2016, global cobalt mine production decreased from 126,000 tons to an estimated 123,000 tons, mainly due to a lower production from nickel operations.

Growth in world refined cobalt operations was forecast to increase at a lower rate than that of world cobalt consumption, which was driven mainly by strong growth in the rechargeable battery and aerospace industries. As a result, the global cobalt market is expected to shift from surplus to deficit by next year.



China is the world's leading producer of refined cobalt and the leading supplier of cobalt imports to the United States. Much of China's production is from ore and partly refined cobalt imported from Congo (Kinshasa); scrap and stocks of cobalt materials also contributed to China's supply.

In 2015 and 2016, China's State Reserve Bureau purchased cobalt for its stockpile, increasing its grip on the global cobalt market.

China is the world's leading consumer of cobalt, with nearly 80% of its consumption being used by the rechargeable battery industry.

The International Energy Agency estimates a global increase to 40 million hybrid cars by 2024, with the batteries of all these cars requiring 7 kilos of cobalt. This alone would push the demand for cobalt to 280,000 tonnes by that time, which represents more than two times today's global cobalt production.

Tesla, the world's largest electric car producer, uses NCA (nickel-cobalt-aluminium) lithium batteries in their electric vehicles (EVs). The raw material by cost for NCA batteries is higher for cobalt than for lithium and are usually a combination of 80% nickel, 15% cobalt sulphides and 5% aluminium. NCA had the highest specific energy or power per kilogram.

Many traditional nickel manganese cobalt oxide NMC batteries, which are typically used in power tools and many electric cars, in energy storage use one-third equal parts nickel, manganese and cobalt.

With prices for lithium carbonate used in the cathode of a battery having more than doubled since 2015, this was reflected in lithium companies offering the highest investment yield in the metal commodity markets last year.



While also the cobalt price started to rally from its lows around \$ 10/lb to around \$ 15/lb by year-end 2016 and was expected to double to \$ 30/lb by year-end 2017, it showed a correction to \$ 23.50 first, before a tidal flow of attention in the media, resulted in booming prices to a recent interim high of \$ 27/lb. This, like for lithium, resulted in equity market rally for cobalt.



First Cobalt creates Western world's largest listed pure cobalt exploration company

First Cobalt is focused on building a diversified global portfolio of assets that are highly leveraged to the cobalt market. The Company's current assets include almost 3,000 hectares and 3 former mines in the Cobalt camp in Ontario. Cornerstone assets include an option for the former producing Keeley-Frontier mine, a high-grade mine that produced over 3.3 million pounds of cobalt and 19.1 million ounces of silver from 301,000 tonnes of ore, as well as a joint venture on a fully permitted cobalt refinery in Cobalt, Ontario.

First Cobalt also has interests in 7 prospective copper-cobalt properties covering 190 square kilometres in the Democratic Republic of the Congo (DRC), all with known surface mineralization.

On 23 June 2017, **First Cobalt** (TSX.V – FCC) and **Cobalt One** (ASX – CO1) signed a letter of intent pursuant to which First Cobalt intends to acquire all of the issued and outstanding common shares of Cobalt One by way of a court approved scheme of arrangement.

The merged company will be the largest listed pure cobalt exploration company with a pro-forma market capitalization of C\$ 110 million and positions itself as the dominant landholder in the Cobalt Ontario mining camp, consolidating almost 50% of the prospective properties in the camp.

Under the terms of the arrangement, Cobalt One shareholders will receive 0.145 of a **First Cobalt** share for each Cobalt One ordinary share, based on the last trading price (C\$ 0.76) of First Cobalt shares on 23 June. This exchange ratio implies a total transaction value of approximately C\$ 140 million on a fully diluted in the money basis.

Following the non-binding letter of intent announced on 21 June 2017, **First Cobalt** also signed a binding letter of intent with **Cobalt Tech Mining** (TSX.V – CSK) on 23 June 2017, pursuant to which First Cobalt intends to acquire all of the issued and outstanding common shares of Cobalt Tech by way of a court approved plan of arrangement.

Through this arrangement **First Cobalt** acquired a portfolio of high quality exploration assets, 14 former producing mines and a mill facility in the Cobalt, Ontario mining camp, complimentary to its asset base at the south end of the camp, approximately 25 kilometres away.

Under the terms of the arrangement, Cobalt Tech will receive 0.2632 of a First Cobalt common share, representing the equivalent of C\$ 0.20 per Cobalt Tech share.



Cobalt 27 Capital, formerly Arak Resources, is a minerals company that offers power-play exposure to cobalt, an integrated element in key technologies of the electric vehicle and battery energy storage markets.

The Company intends to acquire and hold physical cobalt, as well as manage and grow a cobalt-focused portfolio of streams royalties and direct interests in several exploration-stage cobalt properties.

On 24 April 2017 **Cobalt 27** announced that it has entered into several contracts and arrangements which in aggregate constitute a change of business.

Specifically, the Company appointed Scotia Capital, Canaccord Genuity and FD Securities as lead underwriters and joint bookrunners to raise C\$ 200 million through a distribution of 22.22 million post consolidated shares at a price of C\$ 9.00 per share. The Offering was closed on 29 June 2017 and resulted in royalty agreements for the aggregate amount of C\$ 85 million.

Cobalt 27 intends to pursue business model that offers direct and long-term leverage to cobalt price operation and has entered into 6 smelter return royalty agreements on 8 separate exploration-stage properties pertaining to the possible future production of cobalt.

The Company is currently in negotiations with cobalt producers and developers for potential cobalt stream acquisitions.

Cobalt 27 believes that the cobalt purchased under the Cobalt Contracts will represent one of the largest holdings of physical cobalt in a publicly-listed play cobalt company. Under each Cobalt Contract, the Company has been granted an option, but not an obligation, to acquire a specified maximum amount of physical cobalt at the market price.

Each vendor of cobalt was offered the choice of receiving cash, shares or any combination thereof. The Royalty Contracts entered for a consideration of C\$ 1.15 million, are to be satisfied with the issuance of shares at the offering price immediately following closing of the Offering.

Largest cobalt-producing companies in 2016 (in tonnes)

► **Glencore (LSE – GLEN) – total production 21,506 tonnes**

Glencore was the world's largest cobalt producer by a long shot last year, achieving total production of 21,506 tonnes. Right now, cobalt accounts for \$ 1.5 billion of the Company's revenue at the spot price, with every 10% rise adding \$ 156 million to its earnings.

Earlier this year, the company upped its involvement in the cobalt and copper markets after paying Fleurette Group \$ 960 million to increase its stakes in two copper-cobalt operations, Mutanda Mining and Katanga Mining, in the DRC.

Fleurette Group had a total production of 7,595 tonnes in 2016.

On 6 July 2017, it was announced that **Glencore** has signed a large cobalt deal to sell up to 20,000 tonnes of cobalt products to Contemporary Amperex Technologies ("CATL") of China that will help Volkswagen to secure batteries for its electric cars.

National Electric Vehicle Sweden (NEVS) has signed a strategic framework agreement with CATL to secure the battery supply for NEVS 9-3 EV in the Chinese market.

► **China Molybdenum (HKEV – 3993) – total production 9,314 tonnes**

In 2016, **China Molybdenum** paid \$ 2.65 billion for the Tenke mine in the DRC. The mine contains one of the world's largest concentrations of cobalt and is said to offer security of critical battery material for decades to come. Most of Tenke's supply is consumed by China.

► **Vale (NYSE – VNLR) – total production 5,278 tonnes**

Brazil's Vale reported net derived revenues of \$ 29.36 billion from production of 5,278 tonnes in 2016, 14.7% higher than in 2015.

In Canada, **Vale** is active in Ontario's Sudbury Basin, one of its biggest operational sites. Together, six underground mines produce mainly nickel, but also copper, cobalt, PMG's, gold and silver.

The Company's Thomson Complex, located in Manitoba, also produces cobalt, although nickel is the primary metal mined.

Additionally, **Vale** operates the Goro open-pit mine in New Caledonia, where it produces cobalt as a by-product of nickel.

► **Gécamines – total production 4,167 tonnes**

Gécamines, a state-controlled mining company, has minority interests in a number of major DRC mines with companies including Glencore, -based Freeport McMoran (NYSE – FCX) and Canada's Ivanhoe Mines (TSX – IVN) having controlling stakes and operating projects. Gécamines has faced criticism in recent years from the International Monetary Fund and advocacy groups, including global Witness, for selling assets in non-transparent procedures.

Violation of human rights in DRC, controlling close to 60% of global cobalt supply, stimulates exploration boom in Western world located cobalt projects

The DRC mined an estimated 67,700 tons (tonnes) of cobalt in 2016, representing close to 60% of the world's total production of 122,000 – 125,000 tonnes last year. This represents a decrease of approximately 3,000 tonnes compared to 2015, mainly due to lower production from nickel operations. Approximately 20% of DRC's cobalt production is mined by unregular "artisanal" miners and according to a 2014 estimate by UNICEF, about 40,000 of these miners are children. Dealing with this violation of human rights there is a growing tendency to be less dependent on the supply from DRC cobalt, resulting in intensifying the search for cobalt in Western countries, led by the United States, Canada and Australia.

In this respect, it should be recognised however, that cobalt is not a stand-alone metal as it mostly is a by-product from copper and nickel mining and its production consequently dependent from the market prices of these major metals.

Nevertheless, not only the number of cobalt companies is growing (see overview of listed cobalt companies), but also a consolidation process has commenced, including the recently announced amalgamation of **First Cobalt** and **Cobalt One**, creating the largest listed Western cobalt exploration company with a focus on the Cobalt camp in Ontario, Canada. The amalgamated company has a transaction value of approximately C\$ 140 million. In addition, **Cobalt 27** raised C\$ 200 million with the intention to acquire and hold physical cobalt and closed royalty agreements for the aggregate amount of C\$ 85 million.

Although it is too early to value the growing number of cobalt exploration companies on their investment merits, considering the preceding booming lithium equity market this is an illustrative example of the potentially high leverage potential cobalt exploration companies are offering at today's small market valuations, and a number of these companies having already started to distinguish themselves.

Overview of listed COBALT exploration companies (by market capitalization)

30 June 2017	Trading symbol		Share price		Change in %	12 months prices		Total shares issued million	Market cap. million		
			Current 2017	Year-end 2016		H	L		local	US\$	
			C\$	C\$		C\$	C\$		C\$	C\$	
Cobalt 27 Capital	1)	TSX.V	KBLT	9.100	9.000	1	13.20	8.87	24.6	223.9	171.7
eCobalt Solutions		TSX.V	ECS	1.120	0.540	107	1.48	0.45	129.8	145.4	111.5
Fortune Minerals		TSX.V	FT	0.200	0.125	60	0.34	0.10	300.1	60.0	46.0
First Cobalt	2)	TSX.V	FCC	0.760	0.390	95	0.92	0.06	56.7	43.1	33.1
US Cobalt	3)	TSX.V	USCO	0.700	0.200	250	0.99	0.53	50.6	35.4	27.2
Lico Energy Metals		TSX.V	LIC	0.135	0.135	0	0.24	0.07	106.7	14.4	11.0
Cruz Cobalt		TSX.V	CUZ	0.205	0.130	58	0.31	0.10	60.3	12.4	9.5
Castle Silver Resources		TSX.V	CSR	0.255	0.070	264	0.30	0.02	47.4	12.1	9.3
Cobaltech Mining		TSX.V	CSK	0.135	0.240	-44	0.45	0.02	86.7	11.7	9.0
Global Energy Metals		TSX.V	GEMC	0.140	0.160	-13	0.67	0.125	35.4	5.0	3.8
				A\$	A\$		A\$	A\$		A\$	A\$
Cobalt One	2+4)	ASX	CO1	0.130	0.050	160	0.19	0.02	576.6	75.0	57.4
Ardea Resources	5)	ASX	ARL	0.580	0.180	222	0.93	0.17	67.0	38.9	29.8

- 1) name change from Arak Resources - effective 10 April 2017; 1 for 20 shares consolidation as at 23 June 2017
- 2) signed Letter of Intent to merge with Cobalt One on June 23, 2017; Cobalt One shareholders will receive 0.145 of a First Cobalt common share for each Cobalt One ordinary share, representing the equivalent of A\$ 0.11 per CO1 share, based on the last trading price (C\$ 0.76)
- 3) name change from Scientific Metals - effective May 25, 2017
- 4) name change from Equator Resource - effective May 26, 2017; signed Letter of Intent to merge with First Cobalt on June 23, 2017
- 5) listed as at 9 February 2017