

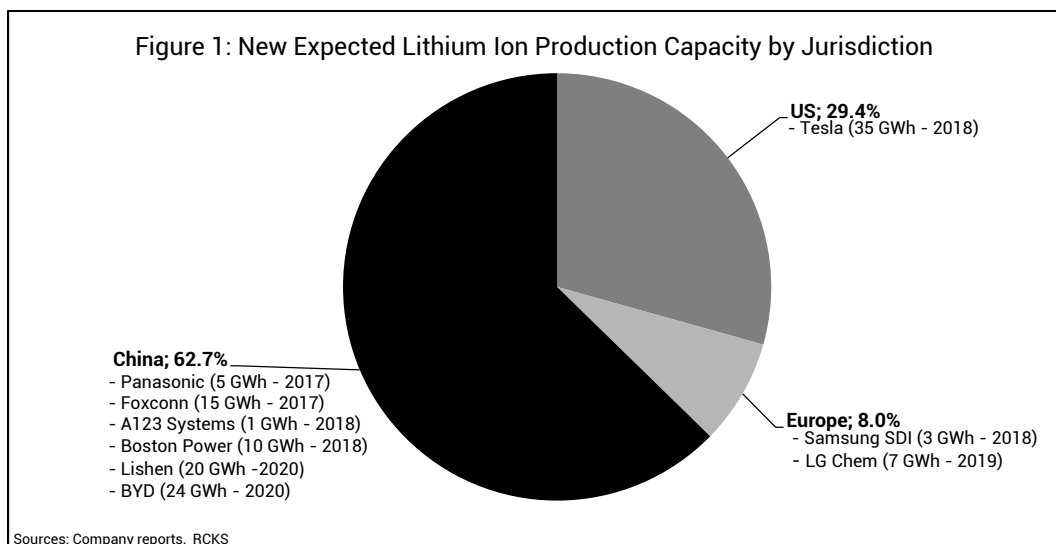
## Battery Metals

November 30, 2016

# Cobalt: Our Favourite Battery Metal

Battery production is expected to ramp up significantly in the next few years and in our view, the best way to play this theme via mining is with cobalt and the underlying equities. While investors have primarily been focused on lithium, and to a lesser extent graphite, to-date, we believe that cobalt, which is the largest component by weight of the favoured lithium ion battery technology, is the best way to play this theme going forward because of expected meaningful demand growth coupled with lack of supply growth and the elevated political risk from the world's largest miner of cobalt, the Democratic Republic of Congo (DRC). While we have identified several exploration and development stage companies looking to advance primary cobalt projects, we favour eCobalt Solutions Inc. (TSXV:ECS), which is developing the Idaho Cobalt Project (ICP), because it is best positioned to benefit from the anticipated near to medium term increase in the Cobalt price.

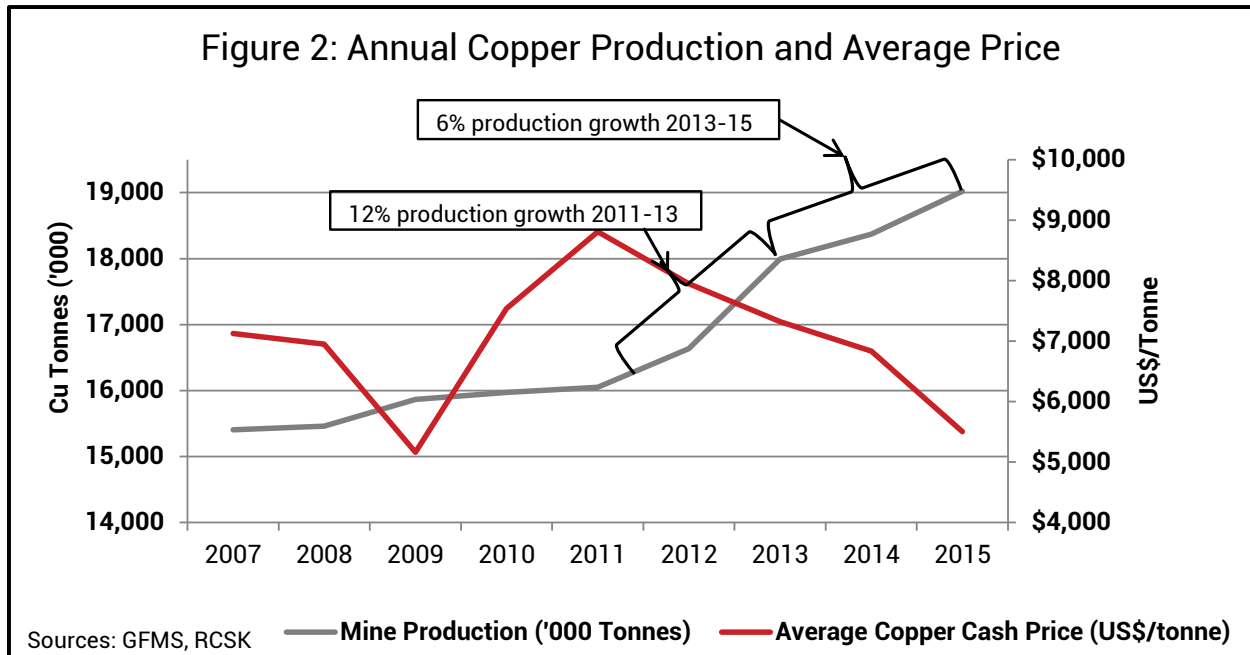
**Electric vehicles and energy storage revolution expected to drive cobalt demand growth.** In recent years, chemical applications accounted for 62% of global cobalt demand. Going forward, we expect the demand increase for cobalt to be driven by the increased production of lithium ion batteries for both electric vehicles (EV) and electric storage systems. Large EV producers, including Tesla Motors (NASDAQ:TSLA), have indicated a preference for nickel-cobalt-aluminium (NCA) batteries, where cobalt makes up 15% of the cathode, and nickel-manganese-cobalt (NMC) batteries, where cobalt makes up one third of the cathode. We have identified an additional production capacity of ~120 GWh that is expected to come online before or by 2020, including the 35 GWh Tesla/Panasonic Gigafactory in Nevada (2018), the 15 GWh Foxconn project in China (2017) and LG Chem's proposed ~7 GWh battery factory in Poland (2019). Of these factories, 63% are expected to be built in China or are owned by Chinese firms (Figure 1). Given this preference for cobalt containing cathodes in conjunction with the current development of various large scale lithium ion battery projects, we expect demand growth to remain at least at the current CAGR of 5%.



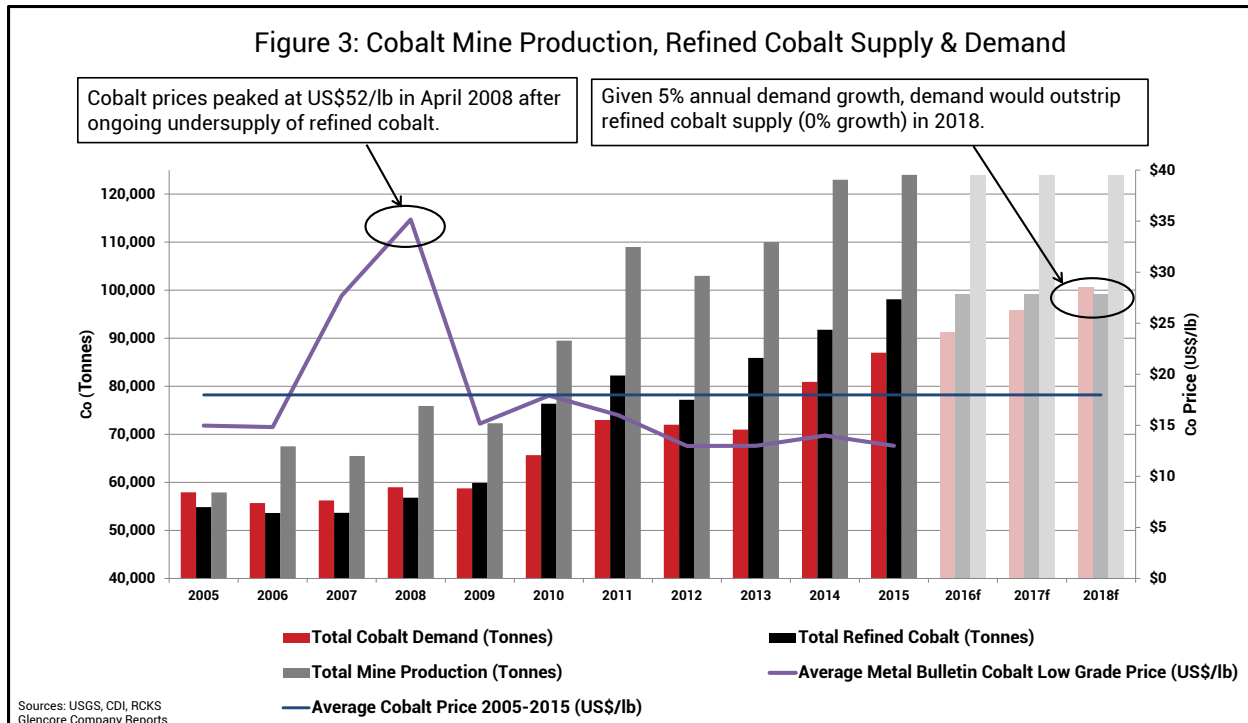
Priced as of prior trading day's market close, EST (unless otherwise noted).  
All values in USD unless otherwise noted.

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**Depressed copper and nickel prices have hindered cobalt supply growth.** Cobalt is primarily produced as a by-product from primary nickel and copper mines, with only ~2% of global supply coming from primary cobalt mines. Accordingly, cobalt supply growth is largely dependent on new nickel and copper mines, and with both metals seeing significant price declines since 2011, there have been few new mines built, particularly in the later part of the downturn. In 2013, global copper production grew 8.2% YoY as a response to prior higher copper prices, while cobalt mine production grew similarly at 6.4% YoY. In 2015, copper production grew 3.5% YoY (Figure 2) and cobalt mine production grew only 1% YoY. As well, we would not expect an increased cobalt price to materially impact base metal producers' investment decisions, because as an example, Glencore's (LSE:GLEN), one of the world's largest cobalt suppliers, mined cobalt revenue amounts to only ~6% of its 2014-2015 copper revenue. This suggests to us that cobalt mine supply growth is likely to remain weak over the next few years. We note that despite the recent rally in both copper and nickel prices we remain far from the levels seen in 2011 and in our view, well below the level that would result in a significant increase in new projects.

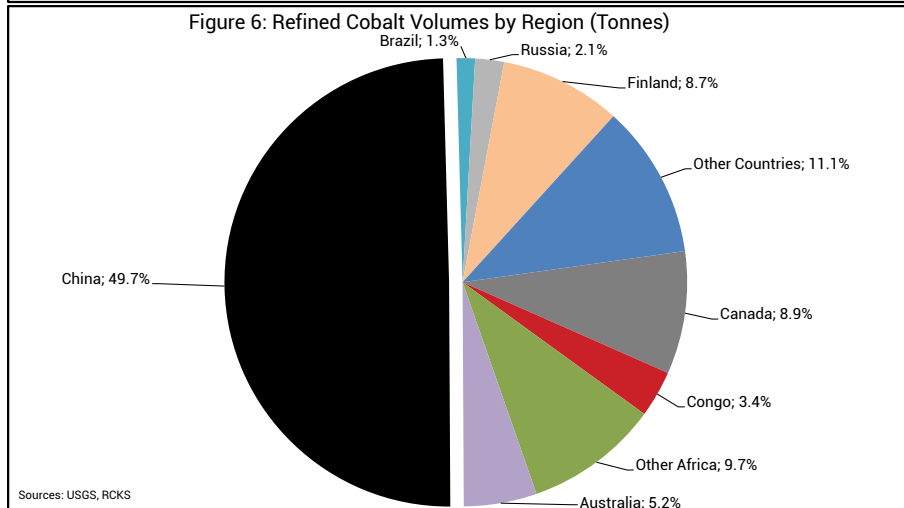
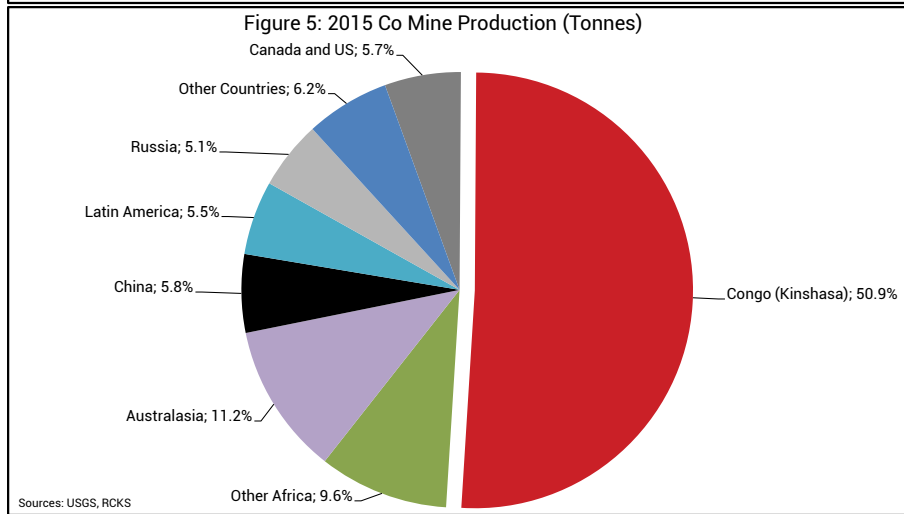
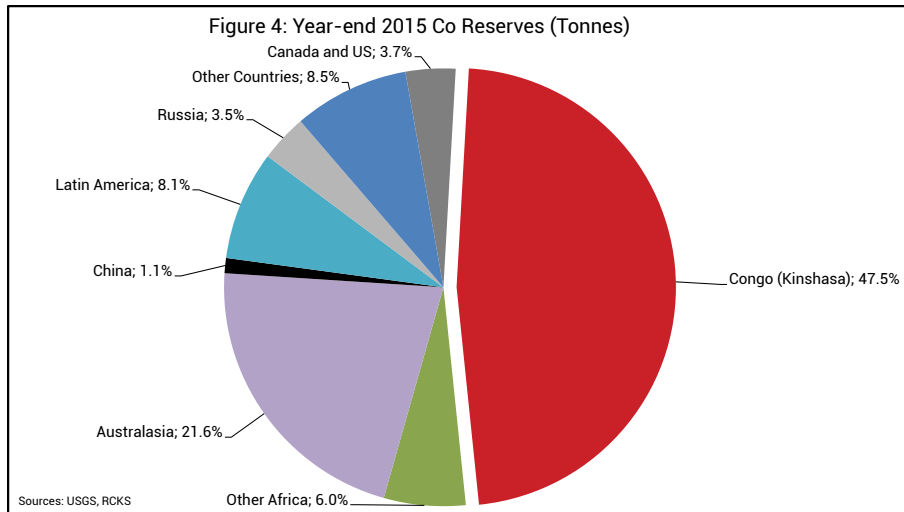


**Demand forecasted to outstrip supply.** Although the cobalt market has sustained a solid demand CAGR of >5%, refined cobalt supply has surpassed demand since 2009 and was +13% in 2015. As discussed above, we continue to expect strong demand growth as lithium ion battery production continues to grow. As limited base metal projects with a cobalt by-product are expected to come online before 2020 and with our expectation that base metal prices have not yet reached a level to accelerate development, cobalt mine production growth is likely to be limited. Consequently, we expect that with essentially flat supply and ~5% annual demand growth, demand is likely to surpass supply in 2018 (Figure 3), which has the potential to drive cobalt prices higher as early as 2017 in anticipation of the deficit. We note that cobalt is generally sold by long-term off take agreements which may result in the effective price increase to producers take longer than is reflected by London Metal Exchange prices.



**Political risk could accelerate an increase in the cobalt price.** The Democratic Republic of the Congo (DRC) is the primary source for cobalt globally, hosting 48% of current reserves (Figure 4) and providing 51% of total mined cobalt output in 2015 (Figure 4). We believe the potential exists for supply disruptions (or perceived risk of disruptions), given the country's history of political instability and its recent decision to postpone this year's presidential elections. If supply from the DRC were to be interrupted, this could lead to a significant supply shock driving the price higher. Therefore, we expect battery producers to favour cobalt production from politically stable jurisdictions. It is also worth noting that ~50% of annual refined cobalt production takes place in China (Figure 6) where some refiners have established relationships with cobalt miners in the DRC. This supports our view that lithium ion battery producers that intend to build factories outside China have to carefully consider how secure their cobalt supply chain is and where the cobalt originates.

**Demand for ethical sourcing along the supply chain favours politically stable jurisdictions.** Another consideration is the growing consumer demand for ethically sourced materials, which puts pressure on companies which source cobalt from the DRC's conflict zones or do not have transparent supply chains. As an example, Tesla has announced it is unwilling to source from places like the DRC, which in our view, creates a significant opportunity for developers of North American cobalt projects.



**Adoption and ramp-up pose the largest risks to our view.** Our expectation for higher cobalt prices is based on the ~5% CAGR demand growth continuing over the next few years, driven primarily by EV and electric storage systems adoption. Should adoption rates decline or the planned construction/ramp-up of battery plants be slower than expected, our expectations for demand to exceed supply would be later than the current 2018 forecast. However, with limited new supply expected to come online over the next few years, even with a cobalt demand growth of 3%, we would expect demand to outpace supply by 2020. On the flip-side, should cobalt prices significantly increase, battery makers may look to other technologies; however, these generally take 7-10 years to develop. As well, a significant increase in copper and nickel prices could result in new projects going into production with the potential for cobalt supply to increase as a result. However, we view this as lower risk as we do not see the supply-demand fundamentals for either commodity to reach price levels (similar to 2011) that would drive a significant increase in mine development.

**Cobalt project development in the US and Canada picking up, we favour eCobalt.** We have identified a few companies which are involved in the development of primary cobalt projects in the US and Canada (Figure 7). Of those, eCobalt Solutions Inc. (TSX:ECS) is best positioned to benefit from a near to medium term increase in the cobalt price. The company hopes to begin initial production of battery grade cobalt salt in the next 18 months with annual output forecast to be 1,500 tonnes over a 12.5 year mine life. As discussed in our recent site visit [note](#), we expect the mine-life to increase. An updated feasibility study is expected in Q1 2017 and we anticipate that the company is likely to complete an offtake agreement for a portion of its cobalt sulphate hexahydrate production along with announcing the balance of project financing around the same time.

Figure 7: Current Cobalt Project Developers in Canada & US

Company Name	Ticker	Price (C\$)	Mkt Cap (C\$M)	Cash (C\$M)	Debt (C\$M)	Project Name	Location	Ann. Production (Tonnes Co)	Capex (C\$M)	Resource (Mlb CoEq)	(% Co)
eCobalt Solutions Inc	ECS.TO	0.63	67.2	3.9	0.0	Idaho Cobalt Project	Idaho	1,500	147	76	0.52%
Fortune Minerals Ltd	FT.TO	0.10	27.1	0.2	4.5	NICO Project	NWT	1,615	589	209	0.11%
King's Bay Gold Corp	KBG.V	0.09	2.5	0.1	0.0	Lynx Lake	Labrador	-	-	-	-
Scientific Metals Corp	STM.V	0.05	5.5	0.1	0.0	Iron Creek Cobalt	Idaho	-	-	-	-
Sunvest Minerals Corp	SSS.V	0.15	4.0	0.1	0.1	Foster Cobalt Project	Ontario	-	-	-	-
CobalTech Mining Inc	NRT.V	0.00	0.0	0.1	0.0	Duncan Kerr Project	Ontario	-	-	-	-
Finore Mining Inc	FIN.CD	0.36	5.7	0.0	0.0	Panther Creek Cobalt Project	Idaho	-	-	-	-
Cobalt Power Group Inc	CPO.V	0.07	2.3	0.1	0.0	Smith Cobalt	Ontario	-	-	-	-

As of close on November 30, 2016  
Sources: RCKS, Company reports, Thomson Reuters

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**Company Specific Disclosure Details**

Company Name	Ticker Symbol	Disclosures
eCobalt Solutions Inc.	TSX: ECS	2
Fortune Minerals Ltd.	TSX: FT	None
Tesla Motors Inc.	NASDAQ:TSLA	None
Foxconn Technology Co Ltd.	TW:2354	None
Glencore PLC	LSE:GLEN	None
Panasonic Corp.	TSE:6752	None
A123 Systems LLC	Private	None
Boston Power Inc.	Private	None
Tianjin Lishen Battery Co., Ltd.	Private	None
BYD Company Ltd.	HKG:1211	None
King's Bay Gold Corp	TSXV:KBG	None
Scientific Metals Corp	TSXV:STM	None
Sunvest Minerals Corp	TSXV:SSS	None
Big North Graphite Corp	TSXV:NRT	None
Finore Mining Inc	CSE:FIN	None
Global Copper Group Inc.	TSXV:CPO	None
Samsung SDI	KS:006405	None
LG Chem	KS:051910	None

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