Ivent Solutions Market Trend Update
August 2019

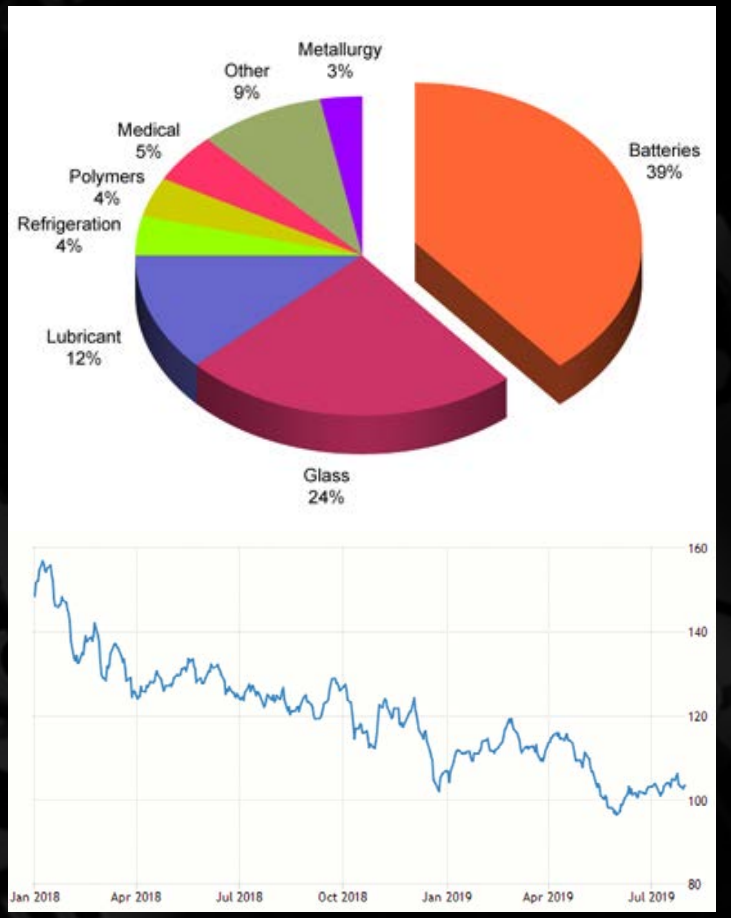
We LOVE Lithium… How much have we got???

Over the last two decades, the lithium-ion battery has caused a transformation in the consumption of metals and minerals around the world. This landscape is expected to continue to change as the Li-ion battery revolution gains pace. From small 10 watt-hour (Wh) packs, to the electric vehicle with a battery capacity of 50–100kWh through to the monster Energy Storage System (ESS) with up to 10MWh, are all becoming commonplace. At the start of the millennium, only a small percentage of cobalt and lithium went into batteries, but by 2015 46 percent of cobalt and 32 percent of lithium went into Li-ion production. Finding a sufficient supply chain of lithium as a raw material is gearing up mining industries for higher production rates. A compact EV battery (as in a Nissan Leaf for example) uses about 4kg of lithium, and if every man, woman and teenager were to drive an electric car in the future, a lithium shortage could easily develop. Rumour of such a shortage developing has been spreading, perhaps prematurely, and the price of lithium has been fluctuating according to supply and demand. However, pricing has been trending down in the last 12 months.

About 70 percent of the world's lithium comes from brine (salt lakes); the remainder is derived from hard rock. Research institutions are also developing new technology to draw lithium from seawater. China is the largest global consumer of lithium, and the possibility of their hoarding of this critical commodity is now being suspected. In 2009, the total demand for lithium reached almost 92,000 metric tons, however in 2018 this was up to 269,000 metric tons. Lithium is also used in other applications besides batteries, as is evidenced in the pie chart illustration opposite. Some additional typical uses of lithium include lubricants, glass, ceramics, pharmaceuticals and refrigeration.

Batteries however consume the largest share of lithium. Now with the advent of the electric vehicle and a literal explosion of uses in consumer and industrial applications, the demand will skyrocket but researchers say that for now the world has enough proven lithium reserves.

Most of the known lithium supply is in Bolivia, Argentina, Chile, Australia and China. The quality levels are acceptable and reports reveal that Brazil has lithium mineral reserves that are not only of higher quality but also have lower extraction costs. In 2019, Western Australia has taken over the number one sport as the largest global producer of lithium, the second largest global producer of rare earths, the third largest global producer of cobalt and the fourth largest global producer of nickel. All good news for the Australian economy!





At this stage the supply of Lithium is reported to be ample and concerns of global shortages are only speculative. To attain one ton of lithium, the Latin American mines use 750 tons of brine (the base material for lithium) and then takes 24 months of preparation. Lithium can also be recycled an unlimited number of times, but no recycling technology exists today that is capable of producing pure enough lithium for a second use in battery applications. It is said that 20 tons of spent Li-ion batteries will yield one ton of lithium. This will help the supply, but recycling can be more expensive than harvesting a new supply through mining. Lithium is commonly sourced from brine, a water and energy intensive process. According to www.foeeurope.org, 0.05-1 mg of lithium requires 1 liter of brine/mineral water. Areas rich in lithium are often arid, increasing the cost of mining. Dry and salty conditions can also take a toll on human health. Seawater extraction is a more expensive way to mine lithium but is potentially the way forward.

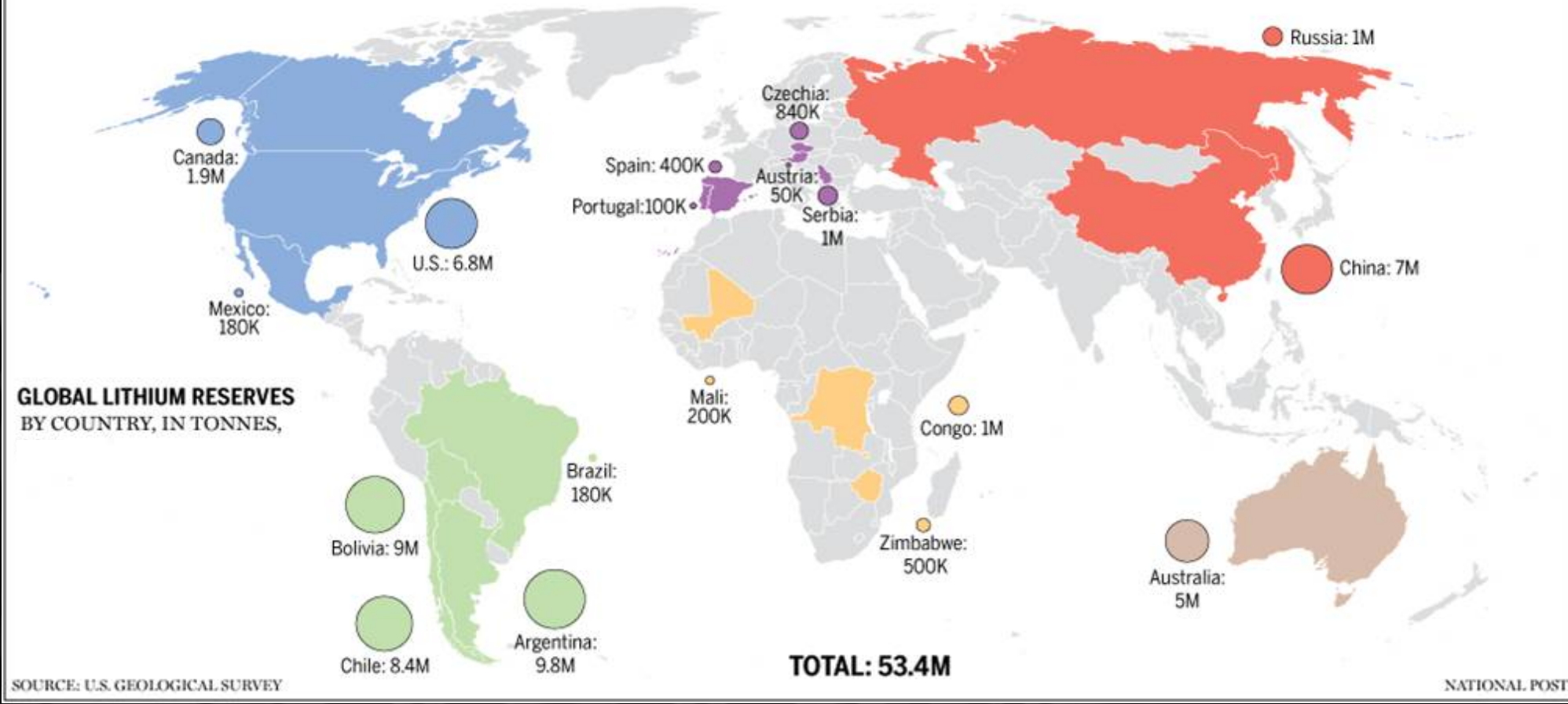
Most Li-ion batteries do not contain lithium in metallic form but in metal oxide. This is in contrast to the metallic lithium battery that uses lithium for the anode. When exposed to oxygen, lithium forms an oxide layer similar to rust on iron that changes the appearance. Exposing lithium to water produces hydrogen and lithium hydroxide. With the presence of oxygen (O2) in the air and hydrogen (H2) produced, the heat created by the reaction can lead to a spontaneous ignition (refer to Ivent articles about the dangers of lithium batteries).

The lithium raw material in a Li-ion battery is only a fraction of one cent per watt, or less than 1 percent of the battery cost. Amazingly, a $10,000 battery for a plug-in hybrid vehicle contains less than $100 worth of lithium. Shortages when producing millions of large batteries for vehicles and stationary applications could increase the price, but for now this is not the case.

Rather than worrying about a lack of lithium, there could be shortages of rare earth materials, should the EV replace the conventional car. One such material is the permanent magnet for the electric motors. Permanent magnets make one of the most energy-efficient motors. China controls about 95 percent of the global market for rare earth metals and expects to use most of these resources for its own production. Export of rare earth materials is tightly controlled.

CHARGE OF THE LITHIUM BRIGADE

As demand for electric vehicles rises, lithium — a key component of batteries — is fast emerging as a valuable commodity



SOURCE: U.S. GEOLOGICAL SURVEY

NATIONAL POST

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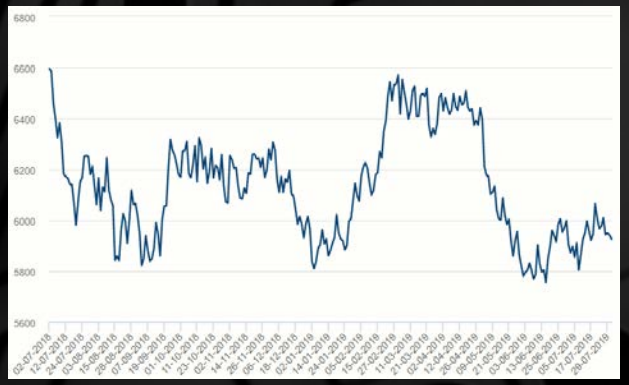
NZD versus AUD - AU$0.955 vs NZ$1.00

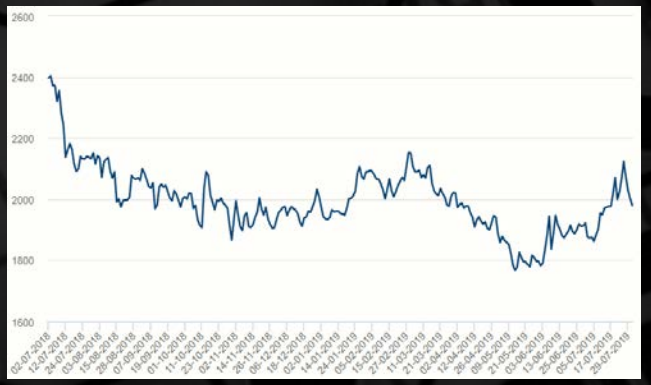
NZD versus USD - US$0.655 vs NZ$1.00

NZD versus EUR - EU$0.590 vs. NZ$1.00

Copper - USD5950 / tonne



Lead - USD2000 / tonne



Nickel - USD14400 / tonne