

Core Consultants on a Lithium Market Reality Check

☒ To quote Robert Friedland at the 2016 121 Mining Convention held in Cape Town, “The lithium market will end in tears.”

Lithium carbonate prices in China have surged by 253% over the last year alone. Forecasts for lithium prices exhibit uncapped exponential growth. Against this backdrop, Mr. Friedland’s sentiments seem completely misplaced.

The main reason for all the fanfare surrounding the potential for lithium, is the fact that it seems to be the battery of choice for the impending surge in electric vehicles. Whilst this is true, we feel that current forecasts neglect to take into account a few fundamental factors, namely:

1) Peak Oil – is this still a thing?

Who remembers about 7 years ago, when “peak oil” was the new buzz word? Peak oil is defined as that point when worldwide daily production starts to decline. The premise was that new oil reserves were not offsetting the declining production, while the demand for oil was expected to keep rising.

If the cost of gasoline rose to \$7/gallon, the cost comparison of purchasing an internal combustion engine vehicle (ICE) vs. an HEV/EV model, quickly favours the uptake of electric vehicles. This fact was demonstrated in the chart below, which indicates that when oil hit an all-time high of \$134/bbl in 2008, HEV sales rose. The correlation between these two factors, oil prices and EV/HEV sales was 78%.

☒ *Source 1: OPEC, Marklines, Core Consultants’ Research*

Oil prices have reached a new low, in part, caused by the overall slowdown in global growth and industrial production, but also due to the increased supply from OPEC (demonstrating

that economists may have called “peak oil” prematurely).

In 2015, there appeared to be a divergence in the oil/vehicle relationship in that oil prices declined sharply, whilst hybrid sales increased rapidly.

☒ *Source 2: OPEC, Marklines, Core Consultants' Research*

If the consensus is that oil prices will not recover for some time, then the question lithium analysts need to ask is whether the relationship between oil and electric vehicle demand has disassociated for now due to policies that support electric vehicle development or whether this is a relationship that should hold true over the long term, in which case low oil prices could constrain electric vehicle and therefore lithium demand.

2) Recycling- becoming increasingly efficient

Recycling of cars and car batteries is not new, but the technology is becoming increasingly sophisticated and the recovery rates are constantly improving.

Most of the value in recycling car batteries comes from the amount of nickel, cobalt, iron and other high-value metals for reuse. The difference in battery values generally depends on the nickel and cobalt content.

However as industrial minerals gain importance and value, it becomes feasible to recycle these batteries and to extract some of these metals.

Last year witnessed the first electric vehicle to be recycled- the Chevy Spark- for its rare earth content. The car was crushed and more than 90% of the rare earth metals were recovered. Not bad going for a first time.

In 2009 The US Department of Energy awarded \$9.5m to Toxco (now renamed 'Retriev Technologies") in order to build the first recycling facility for lithium-ion batteries. We

understand that the facility is already accepting electric car batteries from major manufacturers including Tesla.

With respect to lithium batteries, the batteries degrade with time and retain around 70-80% of their original capacity. Whilst this is not enough to propel an electric vehicle, it is still valuable material and can have other uses, which reduces the requirement for virgin material.

According to Chemetall, within the next twenty years, 50% of the lithium requirement for new batteries will be provided through the recycling of electric vehicles.

3) Alternative battery choices- lithium is not the only option

Last year a client contacted us. They were a major mobile manufacturing firm seeking to extend their manufacturing capabilities into electric vehicles. To do this they needed to understand the cobalt supply chain and secure a supply-partner.

They explained to us in no uncertain terms that if Core Consultants could not find suitable suppliers for them or if our report indicated that using cobalt might tarnish their reputation, that they would move away from lithium-cobalt batteries and make use of other storage devices.

At this statement, I was taken aback and enquired if they really could develop an alternative battery without compromising their current products' quality and if so how long it might take?

The client indicated that they had several alternative storage solutions and each of them were between 4-7 months away from commercialisation and could be implemented without changes to their current service offerings or quality.

"Do you really think we haven't learned from rare earths? Or that we would allow our multibillion-dollar company to be held

ransom to a single commodity?" he asked.

And this is the key – At the moment, since lithium forecasts fail to take into account substitutes and the fact that most mega-corporations have a number of options with respect to which battery they can use, this will place a cap on how high lithium prices may rise.

It is true that currently no other technology is as compelling as lithium. Furthermore, the lithium cost itself is only around 2-3% of the overall battery manufacturing cost. So indeed if lithium prices rose ten-fold It would only increase the input cost from 2% to 20% and battery users will absorb this cost. But what if prices continue to go up 200%? There is a point, whereby no matter how compelling a technology may be, end-users will source alternatives and mitigate their inflation risk.

4) Efficiency of use- the aim is use high value materials sparingly

As a chemistry major, I found experimenting fun, but the discipline itself a bit stagnant. My main concern was that our labs at the universities were always producing known substances instead of creating new substances. Where was the innovation?

This was until a professor highlighted to me that one of the major aspects of being a chemist was to try and see if we could engineer the same material faster or cheaper or by using less reagents. From that moment I was hooked on the economics of the science.

Ten years ago, lithium-ion batteries for electric cars was the dream, not the standard. Apart from technical difficulties, the cost of the lithium-ion battery stood in the way of commercialization. What we have seen over the years, is a steady decline in the amount of lithium required to propel a vehicle. This is known as the "efficiency of use."

We use reagents more efficiently and thereby “get more bang for our buck.”

Take for example the Chevy Spark EV, which uses a lithium-ion battery manufacture by LG Chemicals. For the same power in 2015, the battery pack used 192 lithium-ion cells while the 2014 model used 226 cells. The number of cells required declined by 15% in the space of one year. This example demonstrates just how quickly technology is enabling efficiency of use principal.



Both the number of cells required and the overall cost of lithium batteries has declined with time, rendering lithium-ion batteries feasible for electric vehicles.

The aim of this article is not to be a downer, and **I do believe that the lithium market still “has legs.”** However, it seems that with all the hype surrounding this element, analysts are forgetting that lithium is just a commodity and, as is the case with most commodities, economics and profits drives technological advancements which makes way for substitutes, efficiency of use or recycling and ultimately prevents prices from going unchecked for too long.