Lifton on the critical investments for 2021, lithium and rare earths

written by Jack Lifton | April 24, 2021

Chinese Hegemony, individually, of the World's Critical Materials' Production and Processing, has been accomplished for the rare earths. What is the case for Lithium?

The 14th Five Year Plan of the Peoples Republic of China mandates that by 2025 20% of all motor vehicles produced domestically use battery-powered electric propulsion (BEV). China is already the largest manufacturer of motor vehicles of any one nation. It produces some 24 million such vehicles per year. This means that in 2025 BEV production in China could reach 5 million units per year.

Let's look at the consumption of critical metals by 5 million cars and trucks. The easiest one to consider is rare earths used for the rare earth permanent magnet motors that most efficiently propel the majority of the world's EVs. A premium Tesla uses two such drive motors, which require 5 kg of Neodymium Iron Boron (NdFeB) magnet material per car. Chinese BEVs range in size from larger than Tesla to tiny, cheap, city cars, introduced this year by General Motors and its joint venture partner, SAIC, in China and rapidly becoming a top seller there. If we take the least likely case, that all of these cars would require 5 kg of NdFeB magnets we get a demand for this application of 25 million KG/year, which is 25,000 metric tons.

China's 2020 production of NdFeB magnet was reported as 170,000 metric tons and this output is growing at an average of 8% per year. Even so Chinese magnet manufacturers have announced plans

to add 24,000 tons per year of new capacity just in 2021. Why? It's because although the mandated production of BEVs in 2025 will only use 25,000 tons of NdFeB, the conversion of the Chinese OEM automotive industry to BEVs will ultimately require 125,000 tons per year, and all of this is a new demand. The added capacity in 2021 will allow the conversion of the Chinese OEM automotive industry to 20% BEVs in 2025 to proceed without creating a magnet deficit in the Chinese domestic market. It is this kind of long-range planning that emphasizes the difference between the Industrial Policy Economic Management practiced by the Chinese Communist Party and the so-called "efficient market" system operating in the United States and its allied economies. Although the US Federal Government has also called for the production of 25% BEVs by 2025 and 100% by 2030-35, there is no domestic American rare earth permanent magnet industry which can respond.

You can make BEVs without rare earth permanent magnet motors, but you cannot do so without lithium-ion batteries. And the only truly critical material in a lithium-ion battery is lithium. China's BYD announced a breakthrough in its signature lithium iron phosphate batteries allowing them to achieve (in vehicles) the ranges and lifetimes (cycle life) of the competing "chemistries" using nickel, cobalt, manganese and aluminum. As is the Chinese procedure, the breakthrough was announced in a scientific paper in the British journal, Nature, last month, only after the improvements had been made and entered into mass production. By contrast, American and European battery researchers make their "announcements" when only a laboratory benchtop model has been made.

China today consumes 40% of global lithium production, about 35,000 metric tons (measured as lithium metal) per year. If you add Korea and Japan, the "region" consumes 75% of annual world lithium production. A (standard Tesla sized) BEV battery

requires on average, no matter what the cathode chemistry, 10 kg of lithium, measured as metal. Therefore, the mandated 5 million BEV cars in 2025 could require 50,000 tons of lithium. Uh-oh, this means that in 2025 China alone could require 65% of 2020 global production of lithium, and the total conversion of Chinese auto manufacturing to BEVs would require three times as much lithium per year as is produced globally in 2020! Unlike the United States, China takes a very long view, so it mandates only 50% of vehicles be BEVs by 2030, so it would then need only 130,000 tons per year of lithium for this purpose in 2030 or 130% of 2020 production.

China has been building lithium processing (into battery cathodes) capacity for several years. Its competitors are Korea and Japan, although both of these local (to China) competitors currently produce and sell BEVs in China as well as the rest of the world. China however has created a large and growing global supply network for lithium by buying into existing and junior lithium miners. Many say that China has overpaid in many cases, but if the Chinese Communist Party (CCP) aka the government of China mandates the conversion of the Chinese OEM automotive industry to the production of BEVs and money for overseas "investments" to further the Party's aims is available from the People's Bank of China, PBOC, then the price is not the primary concern.

The USA in contrast to China already has a "fleet" of 325 million cars and trucks on the road in 2021. About 5% of these vehicles are recycled every 12 years, so that today's domestic market for new cars, which is about 17 million per year, is just right for the balance regarding current metal needs for iron aluminum and copper. The USA might be able to convert 20% of 2025 production to BEVs with a demand for that of only 34,000 tons of lithium, but that would mean that just China and the USA would require 100% of global 2020 lithium production. Now throw

Europe into the demand for lithium and there appears to be a problem.

China has already prioritized domestic consumption. Lithium in batteries made in China may soon only be exported in finished goods, such as the BYD passenger buses running in Los Angeles. But if lithium or rare earth demand within China exceeds available supply such exports will be halted.

So, is lithium (and are rare earths) a good bet for long term demand increase and price appreciation? You bet.

A caveat: Beware false prophets who predict endless price increases (a la the “efficient market”) as demand outstrips supply for critical materials in general. The principal barrier to prices that are too high is the control of the internal cost of the goods sold by the critical metal using manufacturers. The most expensive critical metal in a battery for an EV is the lithium. Measured as metal, lithium’s price today is $60/kg. Automotive OEM’s have perhaps the highest capital need intensity and the worst margins among heavy industry. Without subsidies American OEM automotive manufacturers are sensitive to and frightened of runaway costs for traction batteries’ raw materials.

To ensure supply and manage prices European carmakers are already investing in cobalt mining. This is a big change for them. Normally they do not invest so far down the supply chain. A major European OEM automaker is now pursuing investment in the rare earth permanent magnet supply chain. I predict that OEM automotive investment in lithium production at the mine, pioneered by Tesla in the USA, will become the norm as non-Chinese automakers struggle to catch up and keep up with environmental management demand.

Lithium and the rare earths are today the best investments to

ensure future BEV production. Ironically such investments are now themselves **critical**.