# Doing the math on Tesla's potential new demand for flake graphite

In my June 29th article, I wrote about the tear down of a Chevy Bolt which had allowed UBS to review the manufacturing cost of this car's powertrain lower by $4,600.  I also told you they were expecting Tesla to break-even on the Model 3 at a sticker price of $41,000 which they deemed likely based on a high take rate of options.

A lower manufacturing cost for the electric powertrain has caused UBS to review its 2025 EV market penetration forecast.  They now see it at 14% globally, up from 9% before.

Knowing that the annual global production of new cars is well over 90M at the moment, it is fair to expect at least 100M by 2025.  An increase of 5% in this forecast is thus 5M of additional EVs to be produced every year.  In its reporting, UBS also looks at the impact this forecast will have on battery raw materials such as graphite and lithium.

The UBS Global research report is very impressive.  The research team looked at pretty much all aspects to be touched by the electrification of transportation.  The battery raw materials though were not at the center of the analysis as they are discussed on a mere two of the 95 pages report.  They evaluate the Bolt's battery to contain 1.1 kg of graphite per kWh while it is ~0.9-1 kg per kWh for the lithium carbonate equivalent.

UBS is bullish on the graphite and lithium demand.  By 2025, they expect the graphite market to grow by 1.7x as per their base case scenario or by 2.0x if the upside scenario plays out.  For lithium, this is by 4.5x and 7.5x respectively.  The

graphite market today is much bigger than the lithium market. UBS evaluates it at $16.2B while it is $2.7B for lithium. They do not mention the proportion of each type of graphite in this total market value. One has to assume that $16.2B is thus the value of amorphous, flake, vein and synthetic markets together. The li-ion batteries, however, use a feedstock of a combination of natural flake graphite and/or synthetic graphite. As amorphous and vein graphite demand are not expected to grow, one can assume that natural flake and synthetic graphite demands will grow in a higher pace. In the case of natural graphite, the flakes need to be further purified, and both natural and synthetic need to be processed (shaping and coating) to produce anode material. Let's look at this for a moment.

The world flake graphite market is roughly 450,000 tonnes on a yearly basis. The growth multiple of 1.7x on the total graphite market by 2025 looks conservative to me when we look at the combined li-ion battery capacity currently in construction or expansion around the world. We know that Tesla's Gigafactory 1 in Nevada needs 50 GWh of li-ion packs as soon as next year. That will give Tesla enough batteries for a production rate of 500,000 cars. 50 GWh is 50,000,000 kWh. The rule of thumb we use at Nouveau Monde Graphite (TSXV: NOU | OTCQB: NMGRF) is 1.2 kg of graphite per kWh, all li-ion chemistries combined. This type of graphite is the heavily processed anode material also known as coated spherical purified graphite (CSPG). Let's keep things simple and let's assume a yield of 50% from the feedstock of flake graphite when CSPG is produced. The math then tells us Tesla could consume up to 120,000 tonnes of new supply of flake graphite as early as 2018. Obviously, this will be split up with synthetic graphite but I think you get the picture. Tesla by itself can potentially generate a source of new demand of 26% with the Gigafactory1 running at 50 GWh as early as 2018. Musk also said they expect the total capacity of the fully completed Gigafactory1 to be 150 GWh at the pack level.

**The math**

50 GWh or 50,000,000 kWh

Multiplied by 1.2 kg of CSPG

Equal 60,000,000 kgs of graphite anode material.

Multiplied by 2 to account for the 50% yield in producing CSPG from flake graphite.

**Equal 120,000,000 kgs or 120,000 tonnes of flake graphite.**

We are not even talking about the other 16 Gigafactories that are either in construction or expansions elsewhere in the world.  Once completed these 17 Gigafactories will have a yearly combined potential output of 265 GWh of li-ion batteries and that capacity will be available by 2021, not 2025.  When we do the math on 265 GWh, we get 636,000 tonnes of potential new flake graphite demand.  Fast forward to 2025, and the UBS forecast of a growth of 1.7x today’s graphite market appears conservative to me.