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.

Can Tesla make money by manufacturing the Model 3?

I have just returned from London where I attended an event hosted by Patrick Hummel, the Executive Director and Head of European Autos & Mobility Research at UBS. He presented a detailed analysis on the manufacturing cost of the Chevy Bolt. When they extrapolated this cost to the Model 3, the results were very surprising and demonstrated a way that Tesla may improve its bottom line.

For the purpose of this analysis, UBS Evidence Lab entered into a partnership with Munro & Associates of Auburns Hill, Michigan. This firm specializes in teardown benchmarking and accurate costing in the automotive industry. The project included a breakdown of all electric powertrain-related parts and components as well as the modules related to connectivity/ HMI and ADAS (advanced driver assistance systems). The Munro cost estimates reflect the cost an automaker would pay a supplier. Generally, these costs are calculated by estimating the raw material costs, the amortization of parts tooling, an estimate of labour costs and applying an industry standard mark-up for supplier overhead and profit. To create its estimates, Munro looks for numerous variables, including materials and material comparisons, process, machinery, tooling, labour (modelled by region of production), geography, competition, and logistics.

The components of the Bolt under analysis turned out to be $4,600 cheaper than previously anticipated. The car had the "Premier" trim but they also did the math for a "naked" Bolt without any options. The contribution margin of the "Premier" would be 14% or $5,063 over all direct costs, while the contribution margin of the "naked" would be 10% or $3,165. At the EBIT level though, both trims are unprofitable although over the next few years, the economics changes and they start turning profitable. They are further expected to generate an EBIT margin of about ~20% by 2025, assuming the sticker price stays the same.

A lower manufacturing cost has an important impact on the total cost (TCO) of electric vehicle (EV) ownership. UBS now sees TCO parity with internal combustion engine (ICE) cars as early as 2018 in Europe. That's 2-3 years ahead of what they thought before analysing the Bolt. They see TCO parity in 2023 for China and in 2025 for the US where gas is cheaper and environment regulations more lenient.

There are many similarities between the Bolt and the Model 3.

Thus UBS believe the profitability analysis of the Bolt can be applied to the Model 3. Both cars have similar base version pricing, range/battery capacity, a single e-motor with two-wheel drive and about the same interior space. The differences overwhelmingly play into Tesla's advantage. The Model 3 will enjoy the higher premium appeal of the brand which translate into more pricing power and a longer list of profitable options. The rear-driven Model 3 will use a different battery chemistry to be produced at the Gigafactory which will give Tesla more scale in battery manufacturing. The car's software will be kept current via over-the-air-upgrades and it will ship with autonomy-relevant hardware (cameras, sensors) as standard. Tesla's production target for the Model 3 is more than 10 times what GM has for the Bolt. Higher production will likely give Tesla better fixed cost absorption.

There are also differences in the distribution model and marketing. The absence of dealerships allows Tesla to receive the full retail price, whereas GM's manufacturer's suggested retail price (MSRP) includes a ~15% mark-up for the independent dealerships and incentives. However, Tesla has higher distribution costs.

UBS believes the biggest uncertainties in applying the read-across from the Bolt to the Model 3 is the battery costs. Since Tesla has guided for a battery size of less than 60 kWh and accounting for cells with better energy density and economies of scales at the Gigafactory, UBS thus believe the Model 3's 55kWh battery pack will be 26% cheaper to build than the Bolt. They also analysed the expected manufacturing cost of the Model 3 against the BMW 330i and they came to the conclusion that Tesla will lose $2,830 at the EBIT level for each "naked" Model 3 they sell, but will break even at a sticker price of $41,000. For example, enabling autopilot functionality shall allow Tesla to make close to a 100% margin on that option alone. UBS thus sees the break-even price of

$41,000 likely to be exceeded on a high take rate of options.