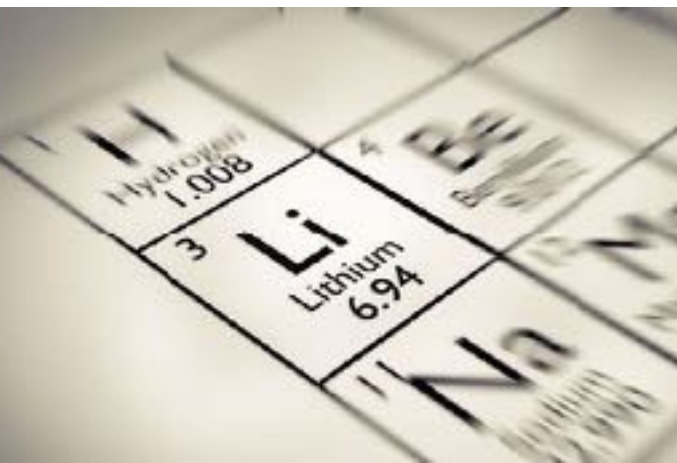


# 1. What is lithium?

Lithium is abundant within the earth's crust, yet rare in sufficient concentrations to be economic

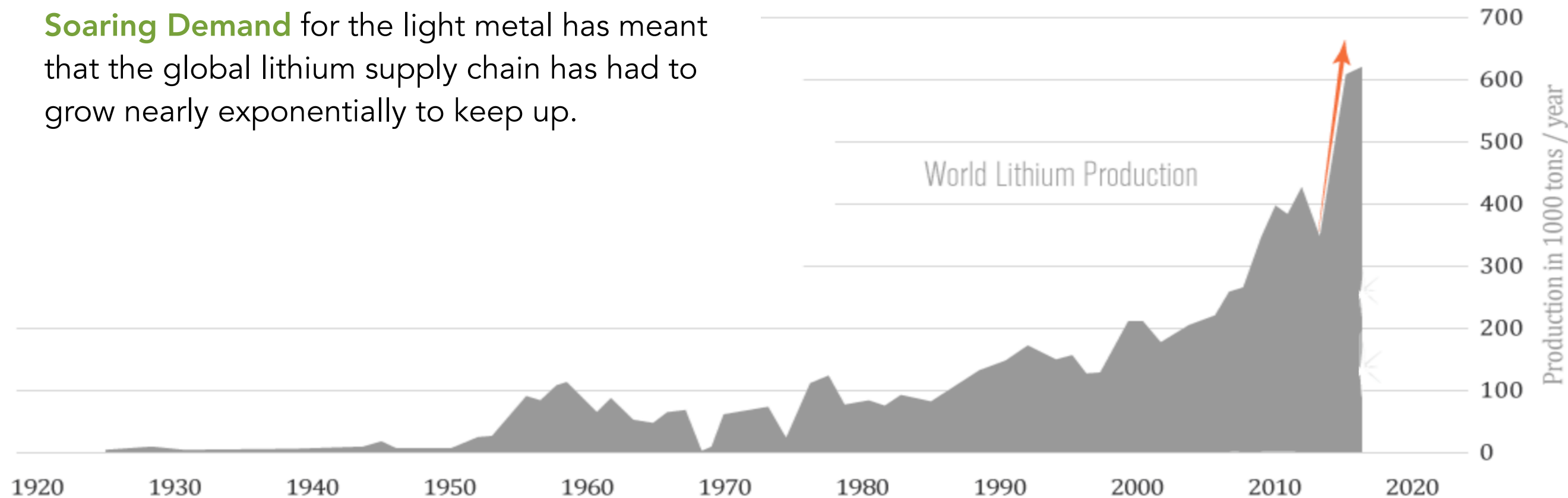
- Lithium is a soft, silver white metal belonging to the alkali metals group.
- It is the lightest of all metals.
- Chemically it is very reactive.
- **Lithium has high electrochemical potential.**
- Lithium is found in both brines and hard rock minerals (for example spodumene), as well as in various other types of deposits.
- It has numerous uses, including glass, ceramics, industrial greases, pharmaceuticals and batteries of various technologies.
- When speaking of lithium as a product, we are generally talking about **lithium carbonate ( $\text{Li}_2\text{CO}_3$ )** or **lithium hydroxide ( $\text{LiOH}$ )**; however, in hard rock mining we are referring to the **lithium oxide ( $\text{Li}_2\text{O}$ )** that forms naturally in certain minerals such as spodumene.



## 2. Why do we need lithium?

Soaring demand within the market

**Soaring Demand** for the light metal has meant that the global lithium supply chain has had to grow nearly exponentially to keep up.



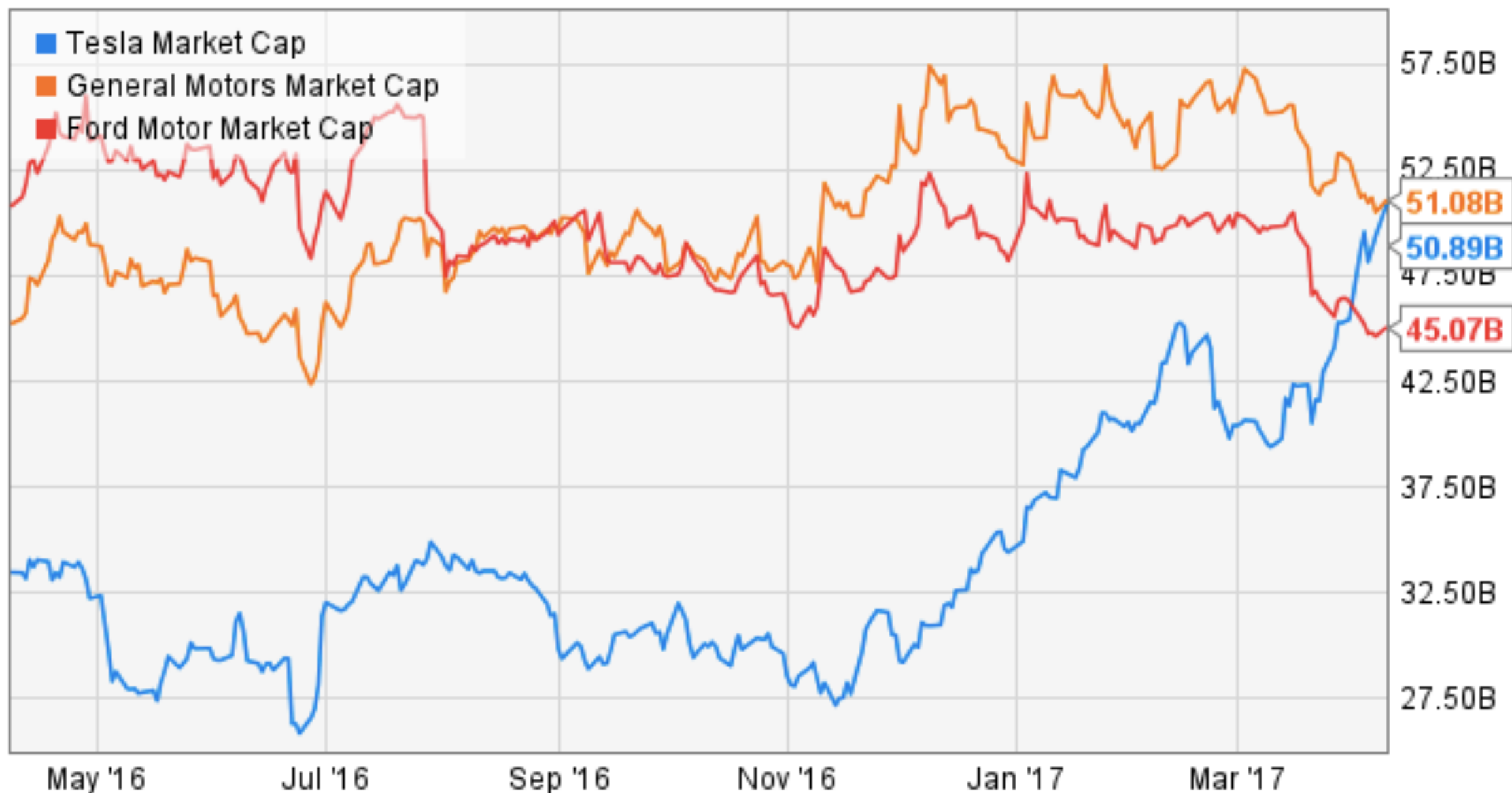
Source: Roskill, Visual Capitalist

- **We cannot ignore that we need lithium now, that lithium demand is growing, and that it will continue to grow.**
- The boundaries of energy storage are being pushed by grid-scale power, electric vehicles and consumer electronics.
- **Lithium is key to addressing our future energy needs.**

## 2. Why do we need lithium?

Auto makers, high tech devices, grid storage, shipping, haulage ...

- In early 2017 **Tesla briefly became the most valuable automaker in the US**, despite selling a fraction of the number of cars of established makers GM and Ford.



## 2. Why do we need lithium?

Demand is growing, not slowing

- While Tesla has stoked plenty of excitement around lithium, **it is only one of many auto makers to announce dedicated EV lines.**





## 2. Why do we need lithium?

Refuting the Morgan Stanley report on lithium pricing — lithium is just getting started

- According to Morgan Stanley, lithium prices are set to fall 45% by 2021.
- Annual supply of lithium carbonate is currently approximately 200,000 tonnes.
- If everything came online as advertised, production capacity could rise by as much as 200 % in the same timeframe, so it's possible we may see some downward pressure on lithium pricing in that timeframe.
- But worldwide exploration expenditure and investment in production is simply not keeping pace with the steep growth in lithium demand, and there are frequent disappointments and construction or startup delays.
- **Of the c. 450 lithium projects in the world today, approximately 3.5% are in production and <3% are in construction. Almost 50% are grassroots and the rest in exploration.**
- **THE MAJORITY OF THIS PIPELINE OF PROJECTS WILL NEVER SEE PRODUCTION.**
- According to Tesla: "to achieve its planned production rate of 500,000 cars per year by 2018, **Tesla alone will require today's entire worldwide supply of lithium-ion batteries.**"
- China has set goals for electric and plug-in hybrid cars to make up at least a fifth of its auto sales by 2025.
- The UK and France have chimed in the beginning of the end for internal combustion engines in Europe by 2040.

## 2. Why do we need lithium?

Tesla's Gigafactory in Nevada, USA is just the start—look to China

- Tesla's Gigafactory has a planned annual battery production capacity of 35 gigawatt-hours (GWh), nearly as much as the entire world's current battery production combined.
- **However, today there are currently as many as 14 mega- and giga-factories reported as being constructed in China alone.**



Tesla Gigafactory final design



## 2. Why do we need lithium?

### Shipping and freight transport

- In December 2017, China launched the world's first fully electric cargo ship.
- While its range is currently short, it reportedly recharges fully in two hours, about the same amount of time as unloading and reloading its cargo.



The world's first electric cargo vessel