Growing excitement in the graphite space – and for good reason

I've been amongst the biggest sceptics of the mania surrounding the graphite business over recent years, along with many of the penny-dreadful share market opportunities claiming to offer investors the opportunity for enormous riches.

I've so far recommended two stocks in the graphite space – Lamboo Resources (ASX: LMB) and Kibaran Resources (ASX: KNL) - as I believe they satisfy the necessary investment criteria.

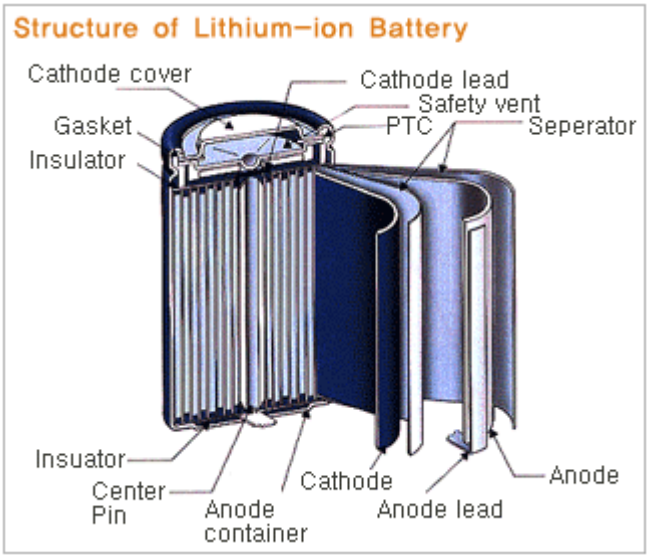
Ignoring the hype, there are clear guidelines that should be strictly adhered to in terms of assessing credible graphite investment candidates. Firstly, the company must retain a focused board and management team with a clear strategy of how to successfully commercialize their project. Secondly, the company's projects must contain high-grade, low impurity, flake graphite that can be utilized in the growing range of high-tech modern applications.

Importantly, the opportunities in the graphite space are very real. The European Commission has included graphite amongst 14 materials that it considered high in both economic importance and supply risk. The British Geological Survey has also listed graphite as one of the materials to most likely be in short supply globally.

China, India and Canada are currently responsible for most of the world's graphite mining and processing, with China producing the lion's share of between 70 – 80%; however China's production comprises 70% amorphous and lower-value, smaller flake graphite.

On the demand side, a number of new technologies are beginning to have a meaningful impact on the graphite market, specifically Lithium-ion batteries, fuel cells, vanadium redox batteries - and further into the future, pebble-bed nuclear reactors. Graphite demand from li-ion batteries has grown from virtually zero five years ago to almost 100,000tpa and now represents 20% of the flake market and continues to grow at 20% annually. The fuel cell market is now a billion-dollar-a-year industry and many products are now going mainstream.

Lithium-ion Batteries



Li-ion batteries are smaller, lighter and more powerful than traditional batteries. They also have no memory effect and a very low rate of discharge when not in use. As a result, most portable consumer devices such as laptops, cell phones, MP3 players and digital cameras use Li-ion batteries and they have now moved into power tools as well. While the batteries used are small, the markets are large and growing rapidly regardless of general economic conditions. Annual growth is estimated at +20% and total graphite demand of 100,000tpa, which is already 20% of the flake market.

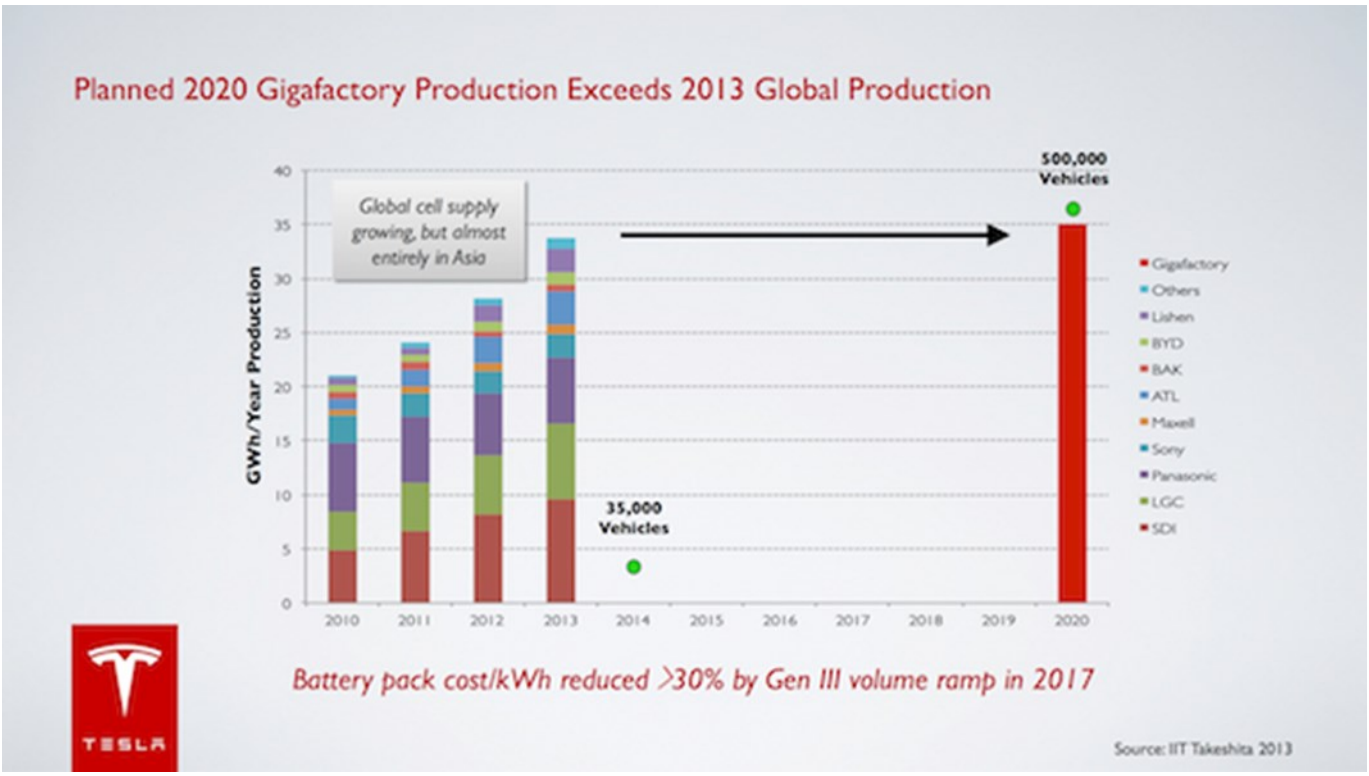
Li-ion batteries are now being used in hybrid electric vehicles (HEV), plug-in electric vehicles (PEV) and all electric vehicles (EV) where the batteries are large and the potential demand for graphite very significant. While this has created a great deal of excitement in the lithium industry, the investment community is only now beginning to focus on other materials used in Li-ion batteries and by weight, graphite is the second largest component. Graphite is the anode material in the battery and there are no substitutes. In fact, there is 10-15 times more graphite than lithium in a lithium ion battery - and because of losses in the manufacturing process, it actually takes 30-40 times as much graphite.

There is up to 10 kg of graphite in the average HEV and up to 70 kgs in an EV. Every million EVs, which is about 1.5% of the new car market, require in the order of 100,000 tonnes of graphite to make the batteries which represents a potential 20% increase in flake graphite demand. China alone plans on having five million EVs by 2020. Annual flake graphite production will have to triple if EVs became even 5% of the new car market.

Only flake graphite which can be economically rounded and upgraded to 99.9% purity can be used to make the spherical graphite used in Li-ion batteries. The process is expensive and wastes 70% of the feedstock flake graphite. Synthetic graphite for these batteries currently sells for around $20,000 per tonne, whereas spherical graphite made from natural flake, with its superior properties, sells for around $6,000 to $10,000 - a huge cost saving and a means of reducing the overall cost of automotive battery systems.

US-based electric car manufacturer, Tesla, announced during late February that it was raising $1.6 billion to build a battery factory that's proposed to be in production by 2017. The significance of the project is that the new factory will produce batteries for 500,000 vehicles by 2020 and aims to reduce the cost of lithium-ion batteries by 30% within three years and by 50% by 2020.

The plan is for construction to start this year, with the facility employing more than 6,000 workers within 10 million square feet of factory space. Panasonic, currently supplying hundreds of millions of cells to Tesla, is likely join in on the new factory.



According to a recent greentechgrid article, an energy investor contact has emphasized that the battery pack is the strategic component to Tesla's vehicle, and just as Apple often does for critical technology, Tesla is vertically integrating. And there are also other opportunities. Tesla could potentially become an entrant into the grid-scale storage industry by way of peak-power substitution.

Peak power substitution involves the use of storage to replace simple cycle gas-fired peaker plants. On a global basis, about 30 gigawatts of new peaking capacity are being added each year to keep up with population growth and increasing electricity demand. At an average cost of $1 million a megawatt, that's a $30 billion annual market. Tesla's Musk recently stated that the cost of Li-ion batteries can be dropped to $100 per kilowatt-hour, which is well below what would be needed to supplant a simple cycle peaker.

Another interesting concept is the use of EVs for vehicle-to-grid (V2G) and vehicle-to-building (V2B) applications. Once enough EVs are on the road, EVs sitting in car parks or at home can be used for many energy balancing functions that are currently performed by utilities. A number of assets are required in order for this to happen, but a company like Tesla can own or effectively control all of them.

Another interesting concept raised in the greentechgrid article is that V2B creates another option in terms of building energy management. "Imagine a 150,000-square-foot office building with occupants that account for 300 cars in the parking lot. Assume that one-third own EVs. Properly controlled, the fleet of EVs sitting idle in the parking lot could offset most or all of the daily peak demand of the office building and still have enough energy to safely drive home.

Savings on reduced demand charges could exceed $1 million per year in several of states, including California and New York. It's easy to see how Tesla could structure a service offering that creates a win-win for the EV owner, building owner, and of course Tesla."

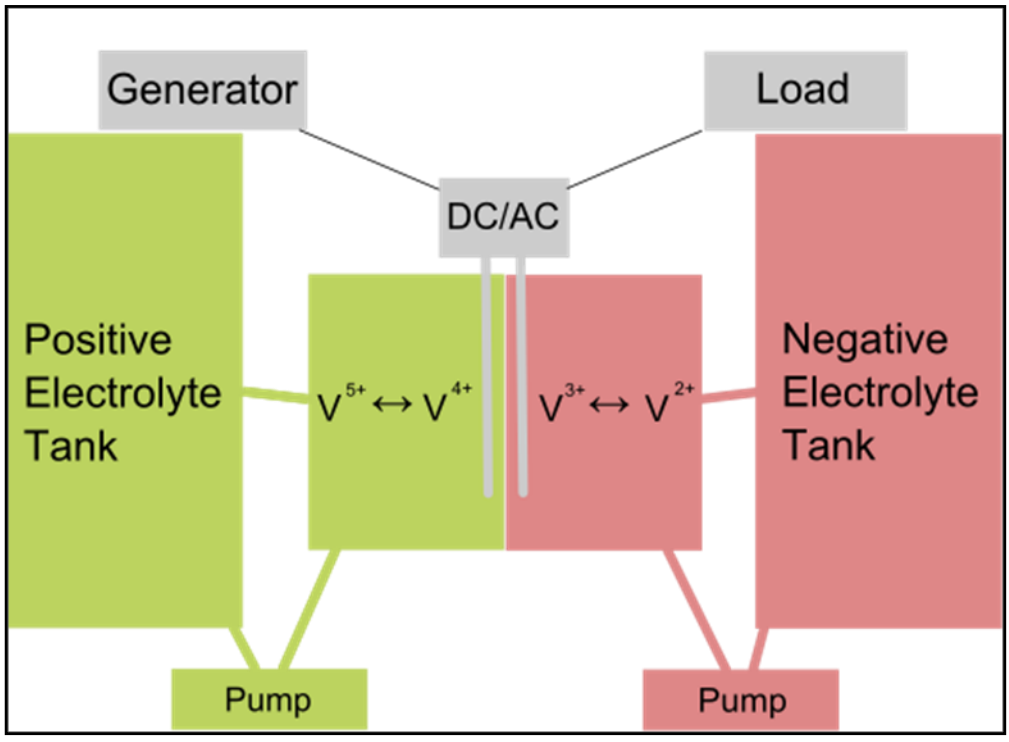
The bottom line is that with its new battery Giga factory, Tesla will no longer be just an EV company, or even a Li-ion battery manufacturer. It's positioning itself to compete in one of the biggest and most lucrative industries on the planet: the utility and power generation industry.

Vanadium Redox Batteries

Vanadium redox batteries are large-scale storage batteries that are ideal for intermittent power sources, such as wind and solar.

They can be scaled to very large sizes, they have long lives with little maintenance and they can provide power very quickly.

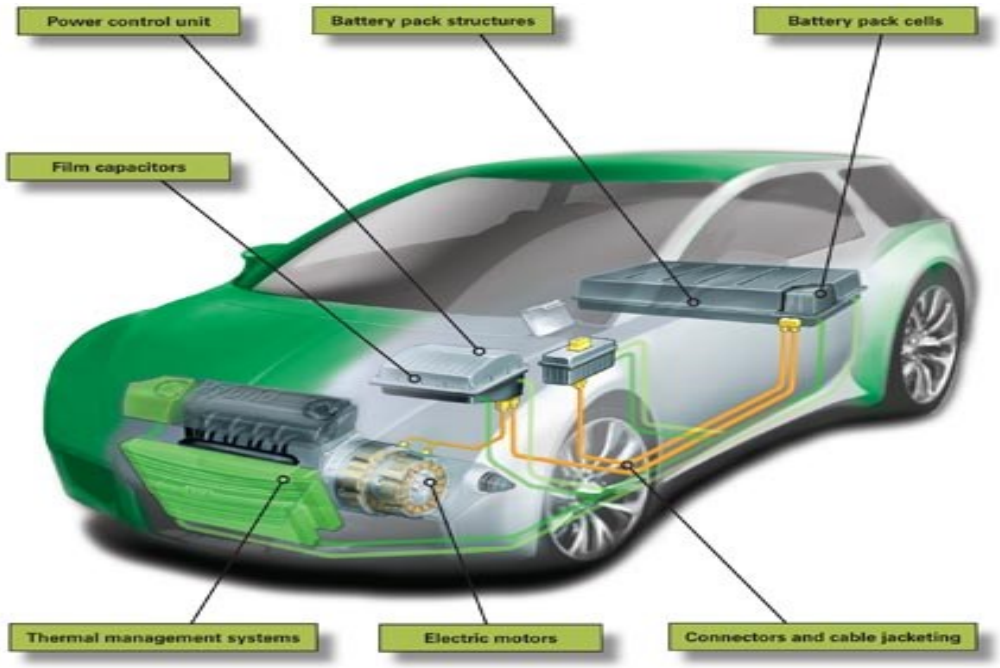
The technology is well established and commercial units are available for home and industrial use.



A vanadium redox battery consists of an assembly of power cells in which the two vanadium-based electrolytes are separated by a proton exchange membrane. The two half-cells are additionally connected to storage tanks and pumps so that very large volumes of the electrolytes can be circulated through the cell to generate power. Similar to the PEM fuel cell, the bi-polar plates in a vanadium redox battery are made out of graphite.

It is estimated that 300 tonnes of graphite are required for every mW/hr of VRB capacity. There are an increasing number of manufacturers and examples of vanadium redox battery installations.
Use of these batteries is price sensitive and will increase as costs come down with higher volumes.

Accordingly, there is good reason to be excited about the future prospects for graphite - and those companies that can demonstrate a credible business plan to take advantage of growing future demand.



Gavin Wendt

Gavin is the Founder of MineLife and the Senior Resource Analyst. He is the author of both the Daily Bulletins and the Weekly Reports. His sole aim is to provide independent share advice that will generate superior returns for you - the investor.

Gavin has been involved in the Australian share market for the past 20 years as a resource analyst, employed in the stockbroking and finance industries. He specialises in researching and evaluating mining and energy companies, and providing independent investment share advice for clients of all types.
After many years as a broking resources analyst with Intersuisse, Gavin helped establish the Fat Prophets Mining Report during 2005, writing and producing the report until he established MineLife during late 2010.
MineLife's core reader group comprises sophisticated investors, finance industry professionals, resource industry executives, retail investors and self-funded retirees.

Gavin's specific interest and expertise lies in identifying up-and-coming resource opportunities, but not just in Australia.Gavin's resource assessment expertise also incorporates companies operating in South America, North America, Europe, Africa, and Southeast Asia.

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