

Meeting a graphene manufacturer: Talga Resources Ltd. (ASX: TLG)

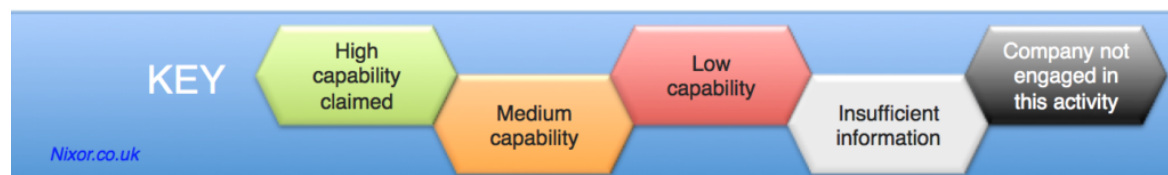
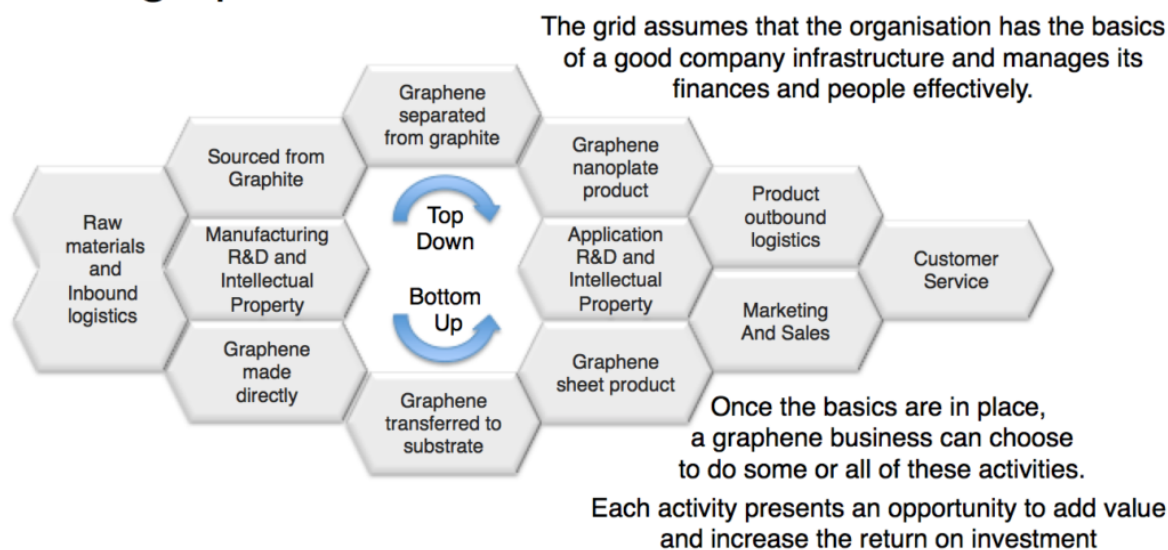
It is a crisp, clear winter morning in London, UK. Today I step from the hustle of the city's financial district into the calm of a modern restaurant. I'm here to meet some people who are creating the future with the wonder material, graphene.

Mark Thompson, the Managing Director of Talga Resources, greets me. The Group R&D Manager, Dr Sai Shivareddy and Professor Siva Böhm, the Chief Technology Officer, soon join us.

We start with the usual guarded pleasantries and discover more about one another's backgrounds. It quickly becomes clear that we are all fluent in the languages of business and science. The pace of our conversation steps up a gear and we cover a lot of ground, fast. I like these smart, motivated people.

Dear InvestorIntel reader, we will need a structure to summarise what I learned. Let's use the [value activity grid for a graphene business](#) as a guide...

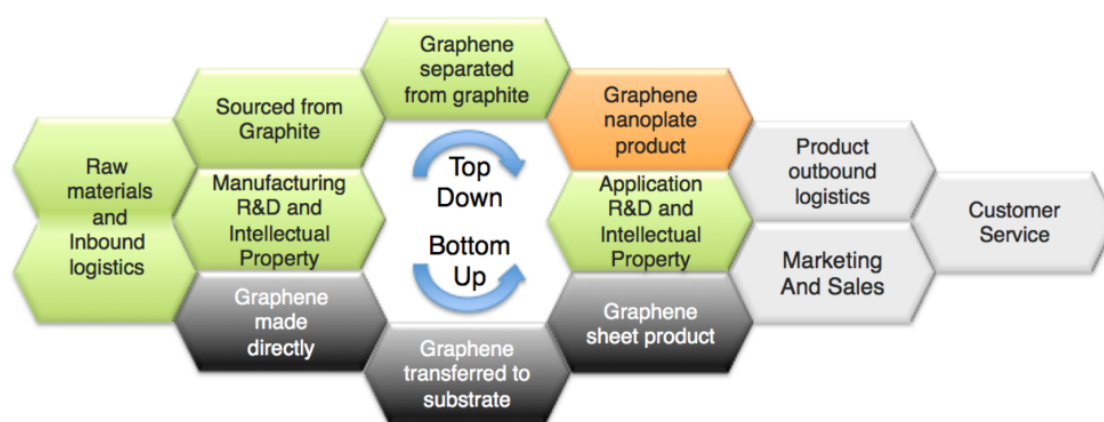
The value activity grid for a graphene business



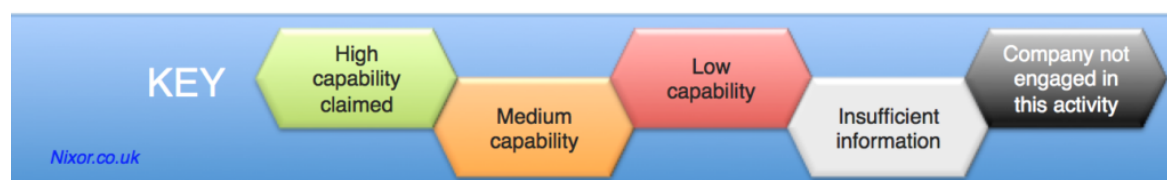
Each block on the grid represents a discrete value adding activity for a graphene business. The blocks can be colour coded in the usual red amber green (RAG reporting) with an additional black colour representing areas where the company has made a clear decision not to be active. Deciding what not to do is an important indicator of focus in an organisation. The grid assumes that the organisation has the basics of good management practise already in place.

The graphene value activity grid for Talga Resources Ltd

Talga Resources Ltd Graphene value activity grid



The grid assumes that the organisation has the basics of a good company infrastructure and manages its finances and people effectively.



Talga has clarity about its production strategy for graphene (The product has the trade name Talphene). It specialises in the top-down method producing graphene from graphite and is not concerned with making graphene by the bottom-up method.

Raw materials, inbound logistics and graphite sourcing

They claim a secure supply of [high quality graphite raw material](#) from five graphite projects that the company owns in the north of Sweden. The graphite ore lies close to the surface so that extraction can be carried out in the open air. The company also claims that the transport infrastructure, from the mines to seaports,

is accessible and reliable. For more information on the Swedish operations please refer to [Christopher Ecclestone's excellent column](#) and [Investorintel published assay information](#). The graphite raw material sourcing and inbound logistics therefore have a high capability rating.

Separating graphene from the graphite ore

The raw material is shipped to Germany for specialist processing. The manufacturing process is a proprietary electrochemical exfoliation and separation technique. The company would not disclose the details but we can make some assumptions based on [publicly available information](#). The Talga graphite ore conducts electricity. So the graphite ore can be placed in water containing a dissolved electrolyte and become one of the electrodes. An electric current can be passed through the ore and the water. This separates out the ore into pieces of graphite, layers of graphene and the host rock matrix.

Talga were reluctant to disclose the details of the exfoliation process, however looking at [a video of the laboratory electrolysis experiment](#) one can see a small amount of gas bubbles (Hydrogen and Oxygen) generated at the electrodes. This means relatively low electrical energy input, (low voltage and current) is used. The electrolysis will create a mix of single graphene and multilayer graphene nano-platelets.

Let's make some further educated guesses. For the separation process [we know that graphene is hydrophobic](#) (water repellent) so a flotation technique should bring it to the surface of the water. Putting the cathode underneath the graphite anode in the processing tank will generate bubbles of hydrogen that rise through the exfoliated material. Gas bubbles generated by the electrolysis of the water are hydrophobic so the graphene will cling to them and rise to the surface. The rock matrix should be hydrophilic and more dense than water, so it sinks.

This exfoliation and separation seems to me to be efficient processes that should not damage the graphene. [Talga claim to extract 76% of the input carbon](#). Therefore the technology of the graphene separation value activity can be scored with a high capability rating.

The graphene nanoplate production process is still in the pilot plant stage, so it has been scored with a medium capability rating. However it should be straightforward to scale to a larger process because this is not an over

complicated design. Any capable chemical engineer scaling up the design will be aware of the safety implications of hydrogen and oxygen gas generation and will build in safe ventilation or re-use of these by product gases.

Applications for the graphene nano-product

In their published material, Talga claim application areas for their graphene in batteries, conductive coatings and corrosion inhibitors. To move up this value chain they need very good scientists working for them.

I'm impressed with the quality of the Talga technical people I met. I like them; they are very credible scientists who publish some of their applications technology in peer-reviewed journals. They will be active in generating intellectual property. For example, they know that a [Talga graphene enhanced coating can reduce corrosion of mild steel](#).

Another example is the [invention of a graphene based nitrite \(NO₂⁻\) detector](#). Sensors such as these are important for measuring accessible nitrogen levels in water used in agriculture. Nitrite sensors are also important for measuring atmospheric pollution levels.

I pressed Mark, Sai and Siva on the nature of their graphene product. They replied that they can produce, graphene, multilayer graphene or graphite and as long as their product created the target benefits for the customer they were satisfied. A commercially aware answer.

This all demonstrates that Talga have the will and capability to climb the value chain from raw materials to functional graphene additives.

Marketing

This is worth a brief mention because graphene is an emerging new technology product.

All graphene companies face a common marketing problem.

Potential customers will not fully understand the benefits for them at the moment. There is customer awareness and education piece that needs to be done before the product can be scaled up. The good news is that Talga has defined its market

segments with some precision and this means they should be able to target their marketing spend effectively. Once they have stimulated demand they appear to have the capability to scale quickly and meet the demand they create.

Summary

Talga Resources Ltd has good access to a reliable source of high quality graphite that it owns. It can transport and process this resource to make graphene nanoplate products that they call Talphene.

The Talga R&D approach is done in a rather pragmatic way, with an eye on practical, commercial applications. The company is targeting its development activity on key market sectors where its graphene additive can improve others products such as anti corrosion coatings, sensors and electrical devices, batteries and concrete enhancement additives for the construction industry.

Final thoughts...

Stepping back into the street, I'm aware of just how much ground we've covered in a short time, the financial centre of London seems a little slower in comparison.

I'm left with an impression of scientific and technical credibility blended with entrepreneurial enthusiasm and commercial capability. This is a formidable combination. Talga Resources Ltd is one to watch for the future.