The new “force” in the emerging graphene space.

Graphene remains a relatively niche product since commercial production of the world’s first two-dimensional material can be troublesome, yet global demand is projected to spiral in the coming years as breakthroughs in processing establish a new paradigm in which the immensely tough material can be manufactured to meet the rapidly escalating number of graphene-based patents being filed worldwide. Talga Resources Ltd. (ASX: TLG) (“Talga”), on the other hand, possess graphite resources of such high quality that it can be milled directly into a graphene product suitable for the additives and battery markets using Talga’s patent-pending exfoliation process.

In fact, two of the company’s five graphite projects host unique ore that allows graphite and graphene to be liberated at an atomic level in a groundbreaking and extremely cost effective way. The graphene produced is of a high quality and suitable for a range of large volume composite, additive and technology applications; this is strongly supported by the number of offtake agreements that Talga have so far secured, including, most recently, a memorandum of understanding with global market giant Heidelberg Cement.

Since graphene is 200 times stronger than steel but far more flexible, it is an extremely desirable substance to concrete and steel manufacturers as an additive, and Talga are developing the ability to meet this demand with a product of considerably greater quality than their peers. In fact, concrete manufactured using Talga materials is stronger, has far higher thermal conductivity and, if used in sufficient quantities, creates electrically conductive and superstrong building materials essential for railway construction, where resistive materials cause signal disturbances.

Further to this, Talga's graphene is suitable for use as anode material in lithium ion batteries before it has even been milled; the unbeatable conductivity of the company's processed ore means that faster charging and longer life cycles are pretty much guaranteed, and we should expect the product to play a key role in batteries moving forward since the advantages over graphite anodes are numerous.

The graphite resources themselves are based in Sweden, with three of them ranking amongst the top 10 highest purity deposits currently known, and the Vittangi Project in particular takes the top spot as a microcrystalline flake resource grading at 25.5% graphite. The extremely fine, pre-crystallised nature of the material found at this site is what makes it suitable for immediate use as a graphene product, since graphene is simply two-dimensional sheets of the carbon atoms of which graphite is comprised.

When ground, it is a curiously smooth and ethereal substance and of phenomenal value to the coatings industry as a result. Talga have already received initial revenues from their product as part of agreements with Chemetall (a BASF subsidiary) and a 3D printer manufacturer for use in speciality inks. Companies such as these are currently serving to validate the product and strategy in order to deliver a decisive business case, but commercial scale graphene production is something that will disrupt a massive number of industries.

Talga's share price has already experienced substantial gains this year, and ~$12m capital raising was completed with institutions and major shareholders designed to fund Talga through to expiry of December 2018. Moreover, the flagship Vittangi project has recently been upgraded to 12.3Mt from the previous 9.8Mt; it seems as if the company is about to become a force to be reckoned with in the emerging graphene space.

Talga’s Graphene Focus Paying Massive Dividends

After generating some of the best graphite results ever seen, Talga Resources Ltd. (ASX: TLG) (“Talga”) have secured deals with two graphene giants to provide essential materials for some of the world’s most ground-breaking new developments. Graphene has been flagged by as a revolutionary technology capable of opening a multitude of new markets, and Talga has the people, resources, and now the commercial go-ahead to be a true leader in their emerging field.

The Deals

Talga announced on 22nd March that they had finalised a joint development agreement with Zinergy, a UK-based energy-tech company focused on producing ultra-thin batteries for which they require a superb quality graphene product. Graphene being extremely thin and highly conductive makes it the material-of-choice for use in the ink needed to print flexible circuitry. The pioneering technology will be used to further develop exciting applications such as wearable-tech, seen by most experts as an inevitable evolution in the booming mobile device sector.

Furthermore, and barely a week later, the company signed with Chemetell, a subsidiary of chemical-goliath BASF, to jointly develop Talga value-added graphene products for use in Chemetall surface treatment products. The joint development program aims to set new industry standards for eco-friendly, high performance, corrosion resistant surface treatments, further empowering Talga’s global impact and resulting in significant movement on company stocks.

Why Talga Graphene?

Talga's Vittangi project already has an existing resource of 9.8 million tonnes at 25.3% graphitic carbon, which is the highest resource grade amongst all the graphite deposits globally. Further drilling was undertaken in December and January, resulting in a great Christmas for Talga, not only confirming that their mega-project has one of the best gradings in the world, but also accidentally proving the existence of significant cobalt and gold deposits throughout the area.

Graphene is to be found wherever graphite lurks, but is notoriously difficult to separate and scale-up. The prohibitively expensive nature of graphene production scares away most companies, but Talga's incredible resource purity is what opened up the opportunity for them to move-in on the true cutting-edge of the cleantech world.

What Next?

The company's focus will no doubt be on its fresh commercial graphite interests for a good while, but the additional opportunities brought about by the discovery of significant cobalt mineralisation will almost certainly come into play this year. Cobalt has received significant attention of late; since conflict-free supplies have grown in demand, the world is looking for offtake from more stable jurisdictions. The particular spread of assets to which Talga now has access, makes them a supreme choice for security of investment this year, as it is almost unthinkable that they would run out of high-end resources to commercialise anytime soon.

Talga have made some excellent market decisions over the last twelve months, switching from their Australian resources to the now-highly-anticipated smorgasbord of Swedish deposits. The area ranks highly for many reasons; notably its established bulk commodity infrastructure with open access

rail, road and ports, and low cost power from hydro-electric and nuclear grid. A corporate tax rate of only 22%, and a tiny mineral production tax rate of 0.2% makes for a very workable model. Add to this the fact that the area has an abundance of highly-skilled workers and it's no surprise that the place was ranked as the second-best mining jurisdiction in the world by the Fraser Institute in 2012-13.

Rarely has there been a company with so many irons in the hottest fires, and investment in these sharp-minded and quick-thinking people would provide much more than just financial returns; there's progress in them there hills.

Talga – Rubber Hits the Road

As we have noted in the past the three key words that best sum up Vittangi are "cheap, cheap, cheap" and they are music to investors' ears in these days where all other things being in a projects favour the Capex then spoils the show. The other mantra is, as we never tire of saying, "production, production, production". The markets may have picked up, but this truism has not gone away. We are not going to "party like its 2008 or 2011" again for a long while.

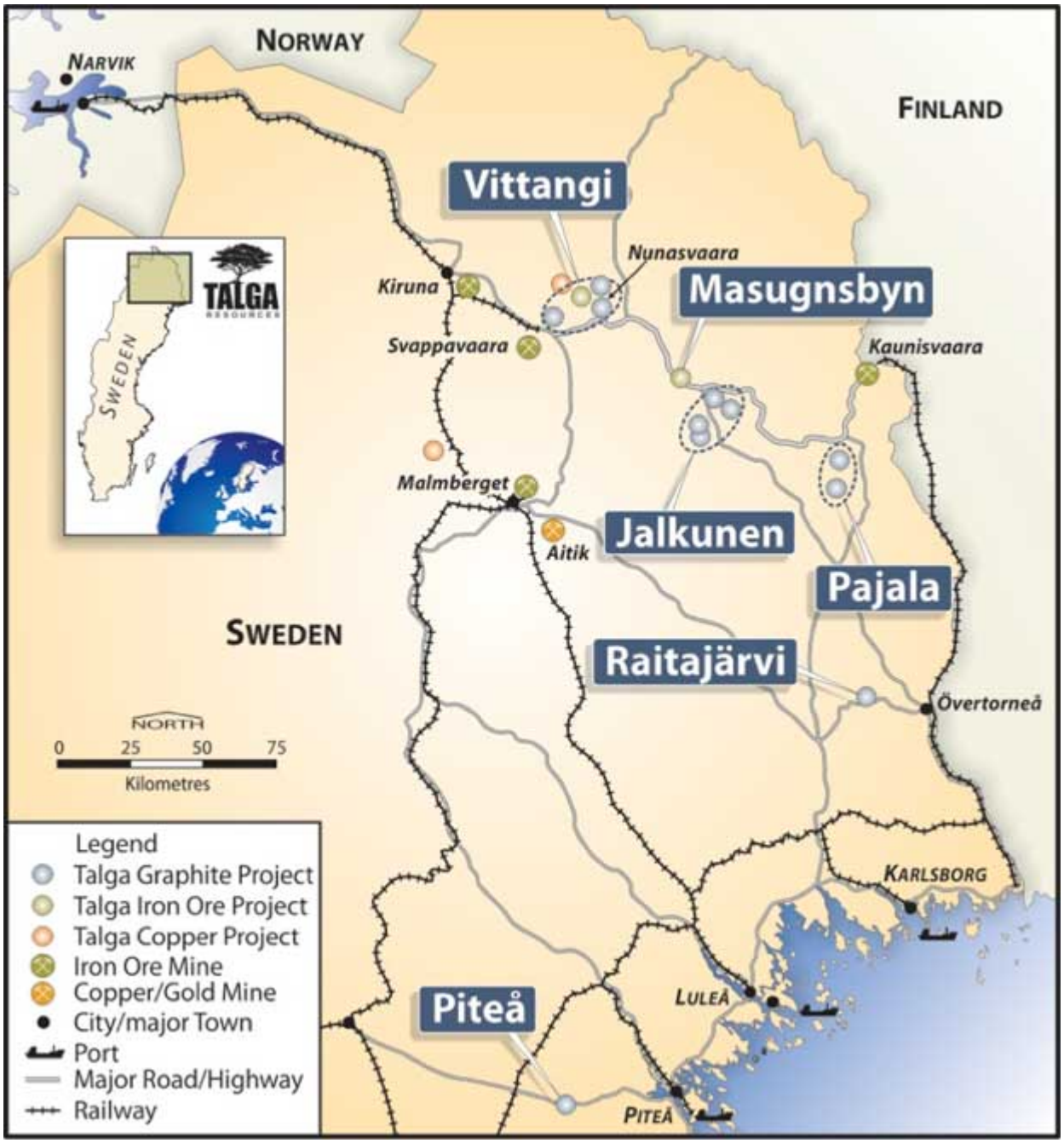
With Talga we have yet another case of a stealth producer creeping up, like the tortoise on the hare, as its two successive campaigns of trial mining are turning into a test of the viability of, firstly, its mining plans and, secondly, its value-added products, primarily for now in the Industrial Coatings space.

In this update I shall look at the progress made over the summer months towards these two goals.

A Refresher

Talga Resources (ASX: TLG) has joined the rush and becomes the second graphite player of note to target Sweden (the other being Flinders, which is also run by Australians despite its TSX-listing).

Talga Resources has five 100% owned graphite projects comprising multiple deposits, all of which are located in Norrbotten County in the far north of Sweden. The two most advanced projects, Nunasvaara and Raitajärvi, both contain JORC Indicated resources. Nunasvaara, which forms part of the Vittangi Project, is a microcrystalline flake deposit, with what the company claims is the highest-grade JORC/NI 43-101 resource in the world (7.6mn tonnes @ 24.4% graphite). Raitajärvi, located some 150kms south-east of Vittangi is a coarse flake deposit, with 49% of contained flake classified large to jumbo size (4.3mn tonnes @ 7.1% graphite).



Talga came out with a Scoping Study for its main target, the Vittangi deposit, in October of 2014. The main findings were:

- Targeting dual production of ~46,000tpa graphite and ~1,000tpa graphene over approximately 20 years
- Low Capex of around AUD$29mn and capex payback 1.4 years
- Around AUD$84/t feed costs for 2% graphene recovery and ~77% total graphite recovery
- Indicative pre-tax NPV in excess of AUD$490mn based only on current JORC Indicated portion of resource – from surface

Stealth Production

While one sometimes despairs that the mining slump left no (or few) lessons learnt we are stumbling across more companies that do seem to have adjusted their strategies for the tough times and that this will hopefully carry on into the better times as there is no assurance “this time around” that money will flow in such an uninhibited and unfocussed way as it did pre-2011. Talga has joined the ranks of those companies that have used the downtime to prove their thesis with trial or micro-mining.

In July the company commenced its second trial graphite ore mining campaign at the Vittangi project with the plan being to extract ~2,500 tonnes as required to feed Talga’s upscaled pilot test work facility at Talga Advanced Materials GmbH in Germany and continue developing the proprietary graphene production process.

The 2016 trial mine is extending and deepening last year’s open pit site and similarly extracting whole multi-tonne blocks of graphite ore from within the total 2012 JORC resource of 9.8 million tonnes @ 25.3% graphite. The mine looked like this after the first season’s work.

For this season Talga adopted improved mining processes compared to the 2015 campaign with the main differences being:

- Larger, tailor-made and automated ore block cutting equipment for improved efficiencies and lower unit costs
- Ore blocks stockpiled in Sweden and delivered to Germany by truck as required

The benches at the start of the July 2016 campaign are shown below:

Slicing large blocks of graphite for dispatch reminds one more of stone quarrying than the traditional mining techniques of blasting and fracturing the material for processing into a concentrate. The advantage comes here from the grade of the

graphite being so high.

Putting Together the Team

In early August the surest sign yet that Talga was determined to hit the road to production came with the appointment of a heavyweight projects manager in the form of Martin Phillips. In an announcement to the ASX the company revealed that Phillips, a chemical engineer, had been appointed as Projects Manager – Europe. He is a veteran project manager, commercial manager and company director with over 25 years in the global metals and mining sector. The responsibilities of the role will include managing Talga's graphene and graphite project developments as well as overseeing and driving of processing operations through Talga's German subsidiary operations, Talga Advanced Materials GmbH.

Building on an early career that included engineering roles in battery recycling programs and smelting innovations at MIM's Mt Isa and UK operations, he constructed and managed operations and implemented growth strategies for offshore smelting businesses. His more recent roles at the mineral sands group, Iluka Resources, included Commercial Manager where his responsibilities were business and industry analysis, supply/demand models, market pricing and strategies.

Though compensation was not mentioned, we can be sure that snagging such an industry veteran didn't come cheap which is a further sign of Talga's seriousness on this front.

Thinking Outside the Box

The graphite space has seen a bewildering amount of applications floated past investors in recent years. Most investor's attention spans did not extend beyond the flake size "debate" and then narcolepsy set in. The "big" theme is the usage in Lithium Ion batteries but it is good to see that not all graphite players are not putting all their playing chips on this one space on the roulette table.

In Talga’s case it has gone in the first instance for coating technologies and the users thereof as its initial end-users. This certainly reduces the competitive field and works on the angle that, being based in Sweden, Talga’s mine/processing facilities are within easy distance of some of the most important industrial users in the world. While coatings may not sound as sexy as Tesla they are considerably more “tried and true” with the total global coatings pre-treatment sector is worth about US$15bn per annum and falls within the US$120bn paint and coatings market, which has reported compound annual growth of over 5%.

In Talga’s opinion its coating technology has the potential to be used in many industries, but is particularly well suited to the automotive, electronics and aerospace markets and anywhere the use of toxic chemicals, such as hexavalent chromium (which Talga’s product does not contain), are banned. Inhaled hexavalent chromium is recognized as a human carcinogen, nevertheless workers in many occupations are exposed to hexavalent chromium in their daily activities. Problematic exposure is known to occur among workers who handle chromate-containing products and those who weld, grind, or braze stainless steel. Chronic inhalation of hexavalent chromium compounds increases the risk of lung cancer. The lungs are the most vulnerable, followed by the fine capillaries in kidneys and intestines. Within the European Union, the use of hexavalent chromium in electronic equipment is largely prohibited by the Restriction of Hazardous Substances Directive.

The product offers enhanced corrosion protection by harnessing graphene’s extreme electrical conductivity, impermeability and chemical structure to form a high performance coating.

Talga also claims that its coating can be applied with industrial scale roll to roll machinery, reducing post-formation spray coating steps and improving manufacturing efficiency across products including automobile bodies to

battery casings.

In recent weeks Talga announced that it had produced and delivered its first value-added graphene based product. The product, a metal pre-treatment coating ("Coating"), was delivered to a leading global coatings company following the filing of a patent application over the Coating composition and production method.

The Coating is the first of a range of targeted value-added products that Talga is developing and looking to commercialise. The global coatings company assessing the Coating will undertake accelerated application and performance trials over coming months.

At the same time, further tests on Talga's coating technology are underway at research institutions in India and the UK, where scientific peer review analysis and publication of the results will be conducted.

Talga has aspirations to create a range of graphite products. The siting of the plant for these endeavours in Germany is a very interesting move by the company and heralds that it sees end-uses away from the almost "plain vanilla" Lithium Ion battery space as the way to go.

Conclusion

With Talga ticking the "cheap (by three)" box and the "production (by three)" box, it has earned a place in our affections.

Like many others in the graphite space, Talga needs to bag an offtaker/sponsor to get a leg up on the competition. At least in its case, the low capex is a draw while the positioning in Europe is also a plus. Flinders has shown it can be done in Sweden with minimal outside interference and for the Swedish government the area where Talga are working is an even higher priority to see economic reactivation and job creation.

Now that pilot production had provided proof of concept then it will be interesting to see if the company moves to a Feasibility Study (unless that phase can be short-circuited) and a partner found to kick-start the capex.

As for value-added products, it would seem that potentially Talga's gain is the chromium mining industry's loss because if its product can gain sufficient traction it should be able to displace hexavalent chromium where it is still used and provide an alternative to those manufacturers grappling with the issue of finding a safe and responsible alternative. Indeed like some others we can think of in the mining space, the idea of pursuing the value-added and downstream alternatives in their "spaces" has been made more attractive by the wrenching times that most miners have suffered since 2011.