EGP Concentrated Value Fund

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EGPCapital

EGP Concentrated Value Fund – 31 March 2021

Searching for Eleven Figures. Part Five: -

This month's will be the last in the "Eleven Figures" series designed to strengthen our unitholders skills in keeping their investment eyes on a horizon further away than most other investors are able to, thereby making themselves impervious to the vicissitudes of daily and monthly share price movements. The company we examine for the March update is PPK Group Limited (ASX:PPK).

We have previously reviewed PPK here (.PDF) and it is worth revisiting that piece before wading into the details below. In the linked piece, we discuss the developing production of Boron Nitride Nanotubes (BNNT). In it, we posited a CAPEX of $12m based on the production figures being achieved this time last year to yield a production of 125kg of BNNT per year.

The AGM update indicated the production rate had improved to 15kg per annum (per unit, per shift) or 45kg per year for 24/7 operation, with the new 4-furnace configuration costing ~$700k each. This improved rate indicates the CAPEX required for 135kg per annum is now down to $2.1m (3 x $700k) or has fallen by over 80% in less than a year.

It is clear there is a steep learning curve in optimising the production process, and PPK have yet to achieve peak productivity. We await further updates from the company on how much outputs have continued to improve, without publicly available figures, it is hard to know where production capabilities are now or will peak. For the sake of putting some numbers around it, we will assume the "end-game" for production is a $1m CAPEX configuration that can produce >0.5 kg per day in continuous production, or ~150kg per machine per annum after allowing for downtime/cleaning/maintenance.

The previous piece also posited a production cost of <$100k per kilogram, as PPK continue to refine the production process, lower the cost of the inputs through scale buying, introduce robotics and reduce the manual labour required to produce BNNT, we believe they will be able to bring the production cost below $50 per gram or $50k per kg. This is important as the lower prices at which BNNT can be profitably sold greatly increases the range of products in which the addition of BNNT to the manufacturing process will yield a product with a viable market.

Even more so than when we wrote about PPK last April, the production side of the BNNT story is now assured, but to create a business worth $10b (this is the Eleven Figure series after all), there must be an end market for BNNT, we will examine that further below.

BNNT is remarkable insofar as when it is introduced into other materials, it alters the molecular structure of those materials. This will be important as we step through some of the applications, the first of which is dental. The use of BNNT in the dental market is also prospectively large enough to be a company-maker on its own.

There are ~5 million implants placed per year in the US alone. That number is likely to exceed 50 million globally and growing rapidly as poorer countries grow their middle-classes. The inclusion of BNNT will make these implants virtually indestructible, the proportion of BNNT in each implant will be modest, but if a reasonable market share could be captured, the potential market is enormous. Implants are likely to be 3D printed and as mentioned, the infusing of BNNT alters the molecular structure, such teeth would be basically indestructible and given how little BNNT would be required to create that security, the cost increase for a BNNT implant would likely be immaterially higher than the current standard.

Another exciting application, but with much larger potential consumption of BNNT is in batteries. PPK's work in this area is being conducted through Li-S Energy (.PDF project presentation) which was discussed briefly in the first PPK update. This business is the most mature near-term commercialisation prospect that will create a mass-market demand for BNNT. Lithium Sulphur batteries have long been theorised as the optimal solution to the energy storage problem. The "theoretical capacity" of Li-S batteries is from three to more than five times the theoretical capacity of Li-ion batteries that are the current industry standard in most fields, sulphur is cheap and plentiful, lighter, and less environmentally destructive than the cobalt, nickel and manganese used in Li-ion batteries.

Unfortunately, Li-S batteries produced to date have been more prone to issues such sulphur degradation (YouTube video, Li-S batteries discussed from 10:25, but the whole video is interesting), dendritic growth and shuttling. The introduction of BNNT into the composition evidently solves these issues. PPK's 52% owned subsidiary Li-S Energy has just completed a pre-IPO fund raising round of $20m at a $300m valuation in preparation for a listing before 30 June 2021. Li-S Energy batteries are deep in their third phase of testing and with the nano-insulation properties and component protection created by the introduction of BNNT into the product composition, the negative effects sulphur degradation, shuttling and dendritic growth appear to have been solved.

To give a sense of the level of excitement the Li-S Energy progress has generated (despite very few being aware of the projects existence), PPK raised $3.25m at a $35.75m post money valuation in June 2020, meaning the $280m pre-money valuation for the raising just completed saw a nearly 8-fold valuation increase in just 9 months. We think the IPO could easily end up exceeding a billion dollars if the advanced state of the development of the battery is fully explained to the market before IPO. Such a valuation would mean PPK's stake in Li-S Energy was worth more than the entire market capitalisation of the business today.

The global battery market is forecast to more than quadruple (by GWh output) in the next 4 years, the question of demand is answered before it is asked. All that need to be established is whether Li-S Energy batteries can be brought to market swiftly and capture a meaningful market share.

Lithium Sulphur batteries are cheaper to produce than lithium-ion batteries, but the introduction of BNNT into the formulation slightly changes the economic calculus (depending on the retail price of BNNT). My understanding is that the equivalent physical size battery, the Li-S Energy battery is likely to be ~20-40% more expensive than the current Li-ion equivalent once the BNNT is included (details around this will be available in the imminent prospectus). If the same size battery were only 3x as powerful and 30% more expensive, the "equivalent cost" would effectively be 55% lower. Also consider this, the current 85kWh Tesla Model S has 7,104 batteries weighing 540kg to achieve the 265-mile range. That range could be extended in two ways by replacing with 2,368 Li-S Energy batteries that would not only have the equivalent (or greater) energy storage but would also lower the curb-weight by ~20% meaning there was less car for the engine to push around, further augmenting range, or the equivalent number of Li-S Energy batteries would give the vehicle an 800+ mile range.

Drones are another battery application where lighter, more energy dense batteries will have enormous value. The flying weight of a drone is critical to the flying times that can be achieved. With Li-S Energy batteries inside them, weights will be significantly reduced, and flying times increased. Drone applications such as in defence, cartography, delivery services and utilities inspections will be greatly enhanced by improved battery life. The global marketplace for batteries exceeded US$120b in 2020 and is forecast to grow in value at 14%+ for the next decade. If Li-S Energy batteries can capture a single digit share of that market, the business would have a valuation of many billions, if the technology were to become an industry standard, the upside is immeasurable.

We spoke about another BNNT opportunity in bullet-resistant glass (~US$7b per annum) market and other polymers in the first PPK update. Other military and ballistics applications are multiples of that market size. A military logistics expert I was talking to told me US military buyers will pay US$20k for every kilo of weight that can be removed from their soldiers and aircraft. Apply that across body armour, bulletproof glass, protective plating on helicopters/planes, the range of military applications is massive.

The project that has the prospect for creating the most massive scale of demand for BNNT is the Strategic Alloys Joint Venture with ASX listed Amaero International (ASX:3DA). Batteries are huge, but the range and scale of applications for hardened metals is breathtaking. Early prototyping of aluminium alloys with BNNT in their construction has shown adding 2% BNNT to the alloy can produce a final product more than 5 times harder than alternative "hardened aluminium".

A satellite bus is a prime example of an obvious end-use for hardened aluminium. Because satellites are exposed to massive temperature variation (>250˚ on the sunny side & sub-zero on the dark side), they apparently last only a few years, but the tech contained inside them could last much longer. Introducing BNNT infused alloys to the satellite bus would likely double usable life. A satellite bus on average contains about 1 tonne of alloy, which at 2% BNNT would be 20kg per satellite. Because of the superior strength, that the total weight of alloy required might halve (or more), but even at 10kg per satellite, there were more than 1000 satellites launched last year I believe, so 20% of that market would be a couple of tonnes per year of BNNT PPK would need to produce. If it became industry standard, >10 tonnes per annum would be consumed.

One clearly massive end application for hardened aluminium is in aircraft. Just looking at the two largest aircraft manufacturers in the world, Boeing has sold 6,065 aircraft in the past decade with 5,406 forward orders and Airbus has dethroned Boeing in recent years as the world's largest aircraft manufacturer. I should preface this section by pointing out that with >5,000 forward orders each, any meaningful incursion into this market is probably 5-7 years away, but the section serves to remind readers that truly massive opportunities exist for BNNT and aircraft construction is one relatively easy to dimension. Although the two major manufacturers would take years to pivot fully to the use of BNNT hardened alloys, there could be some modifications to include BNNT alloys. Furthermore, other manufacturers, particularly with military aircraft applications would likely adopt the lighter, harder alloys much more swiftly.

A Boeing 747 (they don't make 747's anymore, but the math presumably works for other Jumbos) weighs 183,500kg of which high-strength aluminium comprises ~66,150kg. If the additional strength of the BNNT alloy meant half of the aluminium could be removed, it would mean >33 tonnes removed. The human payload of a fully laden 747 is only 27.5 tonnes, so it would be like removing ~1.2x the human payload. The perpetual increase in payload, or reduction in fuel consumption would mean that even if the 33 tonnes of BNNT hardened aluminium was more expensive than the 66 tonnes of normal aluminium, it would still make economic sense. Even if the composition of the alloy used only required 1% BNNT, that would still mean 330kg per jumbo.

The majority of planes Boeing and Airbus build are smaller than jumbos, but we estimate these two manufacturers alone would have consumed ~42,000 tonnes per annum of aircraft grade aluminium on average every year for the past decade. The market including the smaller plane manufacturers would comfortably exceed 50,000 tonnes annually.

<u>The Commercial Case for BNNT Production: -</u>

As we repeatedly stated in the previous "Eleven Figures" pieces, for a valuation to be arrived at we must find a way to dimension a range of prospective earnings onto which we can apply a fundamental valuation. Because of the early stage of commercialisation of BNNT production, this is particularly hard to do, but there are some observable components to the PPK valuation.

The first is their 52% stake in Li-S Energy Ltd. At the last observed price, this stake is worth >$150m. Next is their stake in the legacy mining services business, which had a tough FY20, but is likely worth $30-50m (say ~$40m) if a trade sale were made. They own 65% of White Graphene Ltd, which is valued at >$20m based on the last capital raising valuation. They paid $5m for their stake in Craig Ballistics which would likely be worth at least that considering strong operational performance since acquisition and the $1m in dividends received to date from the holding. The company holds ~$20m cash at last balance date also. If we add these elements together, they add to $235m. At $5.50 per share, the market capitalisation of PPK is $490m meaning, in effect, once we remove these elements, you are effectively paying $255m for the BNNT business of PPK (plus a few joint ventures [JV's] such as the dental products and alloys businesses whose values were not subtracted above).

We earlier posited that based on the improvement in yields from the production processes that a $1m CAPEX would likely yield 150kg per annum once the process development is perfected. Assume then PPK invest $20m into CAPEX to achieve 3 tonnes per annum of production capacity.

If they can find a market for these 3 tonnes per annum @ $250k/kg (less than a quarter of the current prevailing price), it would generate ~$750m of revenues and if our estimate of $50k/kg production cost is correct ~$600m of gross profit (GP). Are 3 tonnes per annum reasonable? Over what timeframe? This is important because if PPK generate ~$600m of GP, the market capitalisation would likely already be close to our target valuation of $10b.

Before we assess whether a three tonne per annum market can be found, consider the internal rate of return (IRR) implicit in the past two paragraphs. A $20m capital investment with a theoretical return on investment of $600m GP.

That is a 1500% pre-tax IRR, or alternatively a 12-day investment payback. If you ever hear of a better prospective return, do be sure to contact us…

Start with one of the small markets. Dental implants weigh perhaps 15 or 20 grams. Assume a 3D printed tooth contains 1% BNNT, assume further that BNNT hardened dental implants could capture only 10% of our estimate of 50 million annual implants globally. This would be 5 million x 20g x 1% = 1 tonne of BNNT. If 30% of that market were captured, you have already achieved the 3 tonne per annum target out of probably the smallest commercial opportunity being pursued.

Consider instead the electric vehicle (EV). EV sales are projected to hit 5 million in 2021 and 30-40 million+ by the end of the decade. Apparently, the Li-S Energy battery cathodes comprises ~2% BNNT by weight. It is hard to know exactly, but each vehicle using Li-S Energy batteries would contain at least 2g of BNNT in its composition, possibly 10g or more.

If we assume Li-S Energy captured 20% of the EV battery market by 2025 on the trajectory described above (35m EV's by 2030 = ~12m in 2025), that will mean 2.4m vehicles would contain Li-S Energy batteries each year. At 2 grams per car, that would require 4.8 tonnes of BNNT within 4 years for a single element (EV's) of a single market (batteries). Our view is that this step-change in the performance of EV batteries would massively accelerate the uptake of EV's, so 35m EV's annually by 2030 would end up way too conservative. We gave the example earlier in the piece of the ability to strip two-thirds of the batteries from a Tesla and have it achieve the same or superior range. Alternatively, you can have the same number of batteries and triple the range. Range anxiety for EV's would be immediately eliminated. I will make this bold prediction, once EV's with a >1,000km range can be produced at costs not meaningfully higher than current internal combustion engine (ICE) vehicles, ICE will be largely obsolete (save for high-performance and specialty vehicles) within a decade.

Then there are the 1.5 billion mobile phones constructed annually, 220m laptops, large-scale battery projects, home-scale off-grid batteries, power tools etc etc etc ad nauseum. If one battery market can be captured, they likely all can.

We said hardened aluminium was likely to be the biggest consumer of BNNT due to the scale of the market. If the satellite bus market were the only viable market due to the high cost of adding BNNT to aluminium, and the weight of aluminium in satellite bus's halved because the BNNT strengthened the frame, there would still be a 500-tonne BNNT hardened aluminium alloy market that would require 10 tonnes of BNNT annually (and growing fast).

Aluminium comprises most of the weight of most commercial aircraft. If a 1% BNNT aluminium composite meant the weight of aluminium in an aircraft could be halved, the ~50,000 tonnes per annum currently used would become 25,000 tonnes. Assume further that to make this market viable, PPK need to sell the BNNT at only a 30% margin to make the cost of the BNNT-alloys stack up for commercial production, you would still have created a 250 tonne per annum market for BNNT which even with a skinny margin, would still have PPK producing ~$15 billion of revenue and ~$4b of gross profits. On this "skinny" profit margin, using our earlier CAPEX assumptions, the IRR would reduce sharply from ~1500% to "only" ~350% on the ~$1.5b of CAPEX that would be required to deliver that production quantity. You will not want PPK paying dividends when reinvestments at this rate of return are possible!

A Boeing 737 costs US$105-125m depending on configuration. It weighs about 40 tonnes, of which ~30 tonnes are aluminium. If you could reduce the aluminium weight by about half, the cost of the 150kg (at 1% BNNT) in the other 15 tonnes of aluminium would be largely defrayed and the cost of the aircraft would only be marginally higher. The lower weight would lead to lower fuel consumption and larger payable loads, meaning the planes would be permanently cheaper to run and permanently capable of carrying larger loads. Furthermore, metal fatigue would be reduced, the planes would last longer too (not to mention the applications for the metals contained inside the engines!). The economics would stack up spectacularly on a lifetime value basis. There is a "carbon emissions reduction" story here too in the reduced weight in a world where fossil fuels are increasingly out of favour too.

These handful of examples of the quantum of BNNT required under the various successful commercialisation options listed ignore the fact that once large-scale commercial production of BNNT begins, there will be dozens of other researchers commencing their work in finding other not yet contemplated applications for BNNT.

Looking at the prospective earnings from that variety of applications for BNNT above, we ask ourselves, does the $255m price imputed by the current market cap strike us as good value. We think it is <u>incredible</u> value.

What Should Management Do: -

One of our fellow travellers in the PPK business is a great friend and mentor of mine and thoroughly enjoyed my metaphor about why PPK is such a great opportunity despite being quite early in the commercialisation phase – "they have so many shots on goal". The point being that if any one of these "shots" score, the company is worth multiples of its current price, if multiple shots score, the prospect of making life-changing investment gains exists. The scale of the opportunity for PPK is immense because of the range of prospective applications, this is also the biggest risk to the commercial success of PPK – management trying to be all things to all people and failing to focus on the largest and best opportunities, giving their competition time to develop a similarly low-cost BNNT production capability.

PPK already seven commercialisation projects underway:

1. Li-S Energy (batteries)
2. Craig Ballistics (ballistics/armour/bulletproof glass etc)
3. Amaero (3DA.ASX) JV (BNNT metal alloys and 3D printed components)
4. Dental Technology (dental implants)
5. Advanced Mobility Analytics (not really BNNT related)
6. Precious Metals (hardened precious metals)
7. White Graphene (.PDF presentation - an alternative to BNNT or carbon-based graphene)

The most important thing for PPK to do is to critically assess the near-term commerciality of the above projects and aggressively pursue the one/s with the most immediate ability to consume vast quantities of BNNT in production. Once the production of BNNT is scaled to deliver that product, PPK will be able to sell BNNT more cheaply into the universities and R&D departments at major corporations, thereby increasing the prospect of new applications for BNNT being discovered, furthering the demand for the product, a virtuous circle.

The other thing PPK will need to do is to be cognisant of their scarce and valuable capital. In our view, the battery market is likely too large for Li-S Energy to meet the demand for their product that will develop. They will likely need to take a "capital light" approach to ensure they can fully meet demand. The obvious option is to JV with a partner/s with existing battery production footprint/s. Even this would likely involve substantial calls on capital. A lower capital alternative would be to licence the technology to these battery manufacturers, but this comes with intellectual property (IP) risks that must be carefully managed.

The situation is similar in production of BNNT infused alloys at scale, we do not want PPK to be investing large licks of capital into production facilities when they will surely be able to find willing partners with existing facilities who would happily JV on favourable terms for the right to produce what will be an incredibly valuable metal product with a range of markets that almost certainly eclipses the two mentioned in this piece (satellites and aerospace). Again, licensing/royalties would be the more capital light option, again, this would come with IP risks to manage.

Of the five businesses we have reviewed in the "Searching for Eleven Figures" series, PPK is the second smallest, if the execution is good, it will almost certainly end up the largest. One should always leave the best for last… - Tony