



ALIGN
RESEARCH

Ironveld

7th January 2021

Financing deal to unlock tremendous value at a world-class high purity iron, vanadium and titanium project in the Bushveld

Ironveld joined AIM in 2012 with Prospecting Rights over a vast 165km² area in the Bushveld, South Africa, with plans to mine magnetite iron ore as feedstock for its own pig iron plant. Since then, there has been a large JORC-resource delineated (2013), a cracking DFS (2014), mining licences secured, environmental approval gained, plus confirmation of power supply from Eskom - major milestones on the road to putting this project into production. All great news but in recent years Ironveld has been treading water. Post a recent £1.15m funding, the board now has 12-months to finally do a financing deal. Last year Ironveld was being helped by IIG in this respect but is now free of their clutches. This stock is in play.

■ Remarkable high-grade iron asset with 3 economic revenue streams

The project's JORC-compliant resource of 56.3Mt grading at 68.6% Fe₂O₃, 14.7% TiO₂ and 1.12% V₂O₅ is capable of producing three economic revenue streams – HPI with a big competitive advantage plus vanadium and titanium. Already a leading offtake partner is engaged for the vanadium.

■ Near-term chance to get into production with smelter acquisition

Securing finance would allow Ironveld to either acquire an identified 7.5MW smelter or build their own 5MW smelter at the mine site. Beyond that are plans to build a new 15MW smelter and double production.

■ Chance of early cash flow from JV deal supplying magnetite ore

Ahead of all that, a deal could be in the offing to mine/crush/supply ore which could really improve Ironveld's negotiating stance in financing talks.

■ Risked conservative NPV plus peer comparison shows upside of 376%

Our conservative valuation illustrates the potential. We initiate coverage of Ironveld with an initial target price of 3.26p and **Conviction buy** stance.

Table: Financial overview

| Year to end June | 2019A | 2020A | 2021E | 2022E |
|------------------|--------|---------|--------|--------|
| Revenue (£'000s) | - | - | - | 556 |
| PTP (£'000s) | (625) | (1,019) | (592) | (258) |
| EPS (p) | (0.10) | (0.16) | (0.06) | (0.02) |

Source: Company accounts & Align Research

This investment may not be suitable for your personal circumstances. If you are in any doubt as to its suitability you should seek professional advice. This note does not constitute advice and your capital is at risk. This is a marketing communication and cannot be considered independent research.

CONVICTION BUY

Target price – 3.26p



Key data

| | |
|------------------|-------------|
| EPIC | IRON |
| Share price | 0.685p |
| 52 week high/low | 1.28p/0.36p |
| Listing | LSE |
| Shares in issue | 1,298m |
| Market Cap | £8.9m |
| Sector | Mining |

12 month share price chart



Analyst details

Dr Michael Green
michael.green@alignresearch.co.uk

IMPORTANT: Ironveld is a research client of Align Research. Align Research & a Director of Align Research hold a major interest in the shares of IRON. For full disclaimer information please refer to the last page of this document.

Business overview

Ironveld Operations

Ironveld is an AIM-listed exploration and development company focused on Africa.

- **High Purity Iron, Vanadium and Titanium** - located on the Northern Limb of the Bushveld Complex in Limpopo Province South Africa. This project has the potential to become a low-cost producer of high purity iron (HPI) along with producing vanadium and titanium by-products. **The company has a JORC compliant mineral resource which contains 32 million tonnes (Mt) of iron in situ along with 9Mt of titanium and 1.6 billion pounds of vanadium (which equates to four times annual global demand).**

There are near, mid and long-term opportunities here. Phase 1 is the near-term opportunity provided by the pending acquisition of an existing 7.5MW smelter, where an acquisition deal has been agreed. To start the mine and buy the smelter will require R300 million (\$20 million). The team is also looking at building its own smaller 5MW smelt on site which would come with a similar costs. Either of these moves would serve to begin to unlock the project's undoubted potential.



Magnetite outcropping at Ironveld's project in the Bushveld. Source: Company

High Purity Iron

High Purity Iron (HPI) is used in the production of stainless and nickel-based alloys. Iron powder is produced in many different grades for a variety of applications and comes in particle sizes which vary anywhere from 20µm to 200µm. Such powder combined with a denser charge results in lower energy requirements and faster melting times in steel manufacture. The demand for HPI (as water atomized powder) continues to increase as it is commonly used in the automotive industry, powder metallurgy and magnetic materials.

Sintering is the process of fusing a powdered material into a solid. Sintered components are created using Powder Metallurgy (PM) which finds its way into motor vehicles, power tools and white goods. By and large, motor vehicles have something like 10kg – 27kg of PM components. Other uses for HPI include soft magnetic components, welding rods, pharmaceuticals, chemicals, printing, filtration and surface coating.

PM manufacturing is seen to be quicker and more efficient and provides a number of clear potential advantages over traditional ingot metallurgy processes. Firstly, very-complex shaped components (such as helical gears in the automotive industry) can be produced that would be difficult or near impossible to produce using traditional manufacturing techniques. This results in greater freedom in design. Secondly, there are significantly lower production costs due to lower energy utilisation along with substantially reduced material wastage as there are fewer production steps along with less machining.



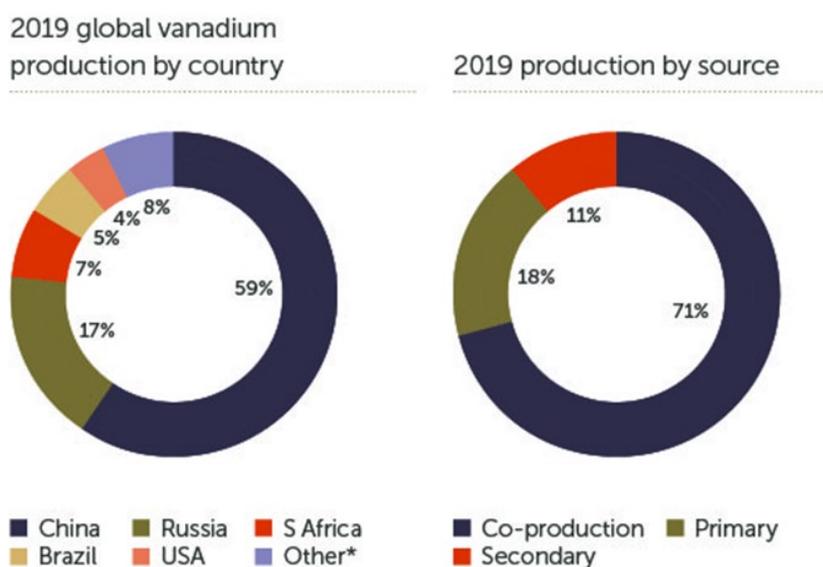
HPI is used in PM which allows very complex shaped components to be manufactured.
Source: Company

Thirdly, the final components' properties can be tailored relatively easily by mixing other metals into the powder blend to provide hardness and wear resistance along with providing self-lubrication by controlling the porosity. Lastly, a wider range of metal compositions is possible than with traditional techniques where certain metal mixtures are incompatible or impossible due to chemical, thermal and containment constraints. Given all these factors, it is little surprise that PM has been heralded as being a green technology.

Vanadium

Vanadium is a hard, ductile, silver-grey high-value metal where something like 85% of production is used to make ferrovanadium, an alloy of iron and vanadium, which is used in the production of steel and other alloys to increase strength. One kilo added to a tonne of steel will effectively double the strength of steel. As a steel additive, as well as increasing strength, vanadium also increases strength, toughness and heat resistance for use in gears, axles and crankshafts. Nowadays there seem to be growing additional uses for high purity vanadium including in aerospace, chemicals, catalysts and in vanadium redox flow batteries (VRFB).

Over 80% of vanadium is recovered from magnetite and titano-magnetite ores generally as a co-product with iron rather than from primary production. In addition, it can be recovered as a secondary product from alumina slag and fly ash. China is the world's leading producer of vanadium with the majority coming from co-production. **Currently, vanadium is only recovered as the primary product from three mines worldwide – two in South Africa and one in Brazil. Other such mines have closed in recent years, which serves to restrict supply.**



Global vanadium production by country and source (2019).

**other includes Austria, Belgium, France, Germany, India, South Korea, Netherlands, New Zealand, Taiwan and Vietnam*

Source: Bushveld Minerals.

Demand for vanadium in the steel market has been forecast to grow by around 2.5% CAGR until 2027. **However, demand for this metal looks as though it could rise substantially due to the advancement of VRFB technology.** In a nutshell, VRFBs store energy in liquid vanadium electrolyte (which makes up to 80% of the VRFB) which never degrades. This looks like being the ultimate green energy storage system as the hardware can be recycled whilst the vanadium can be used repeatedly.

VRFBs are fast being heralded as the most sustainable and advanced technology available for large scale energy storage for electricity generated by solar and wind. These redox flow batteries can discharge and be recharged 20,000 times with little loss performance. In fact, VRFBs do seem to offer the potential to give rise to a true revolution in power grids and brand-new applications based on sustainable energy storage. **The real key to the full-scale commercialisation of this green energy storage technology looks as though it really hinges on having a sustainable supply of vanadium.**

For these sorts of reasons, the World Bank in a 2019 report on battery metals reckoned that vanadium would be one of the top five minerals to see a significant increase in demand by 2050 on the back of a forecasted 500% increase in demand for battery metals. This is all in order to meet the mushrooming demand for clean energy technologies.

Titanium

Titanium is a lustrous metal with a silver colour, low density and high strength, which is resistant to corrosion in sea water, aqua regia (a mixture of nitric acid and hydrochloric acid that can dissolve gold and platinum) and chlorine. The metal is in demand for its combination of corrosion resistance and high strength-to-density ratio.

The metal can be alloyed with iron, aluminium, molybdenum and manganese to produce strong light-weight alloys for many uses including aerospace, defence, industrial processes, automotive, agriculture, dental implants, smart phones and other applications. There is also the potential for incorporation in modified lithium-ion batteries that use lithium-titanate nanocrystals rather than carbon on the surface of their anode.

Titanium naturally occurs in ilmenite (92-98%) and rutile (35-60%) and titanomagnetite (2-20%) minerals, as well as others, in oxide form. Most of these minerals are processed into synthetic raw material in the form of TiO_2 slag due to the presence of iron along with other valuable elements.

In the ongoing automation of traditional manufacturing and industrial processes using smart technology (seen as being the Fourth Industrial Revolution), titanium powder is the dominant metal powder being used in 3D printing (also known as additive manufacturing). Products printed by sintering titanium powder together with a laser to produce metal parts (such as medical implants and devices) are seen as being as good as those which are manufactured by traditional means. 3D printing is now being widely used in the aerospace industry, automotive industry, and in the medical and pharmaceutical sectors.

Background

Ironveld plc commenced trading on AIM in August 2012 with an initial market capitalisation of £19 million following a placing that raised £3 million at 6.75p per share. At that stage, the group already had interests in Prospecting Rights in the Northern Limb of the Bushveld Complex north of Mokopane, South Africa. The rights covered a group of seven adjacent farms which spanned an area of 165km² where Ironveld intended to mine the Ti-magnetite iron ore as feedstock for its own pig iron plant.

On admission, the company planned to rapidly develop the project with the intention of commencing production in 2015, subject to receipt of the appropriate Mining Rights and also securing the necessary funding. At that time, the board made no secret of the fact that Ironveld would consider other iron ore opportunities in the vicinity of this project, when and if they became available.

June 2013 saw the publication of a positive Pre-Feasibility Study which assessed the economic viability of its pig iron and ferro-vanadium project on the Northern Limb of the Bushveld Complex. The study demonstrated the viability of developing the Ironveld Pig Iron Project, delivering one million tonnes per annum of pig iron and 9,670t of Ferro Vanadium (FeV) production from 2019. The post-tax project IRR came out at 28.8% with a NPV(10) of ZAR10,694 million (US\$1,069 million) with a capital payback of seven years. There was estimated capex of ZAR9,375 million (US\$938 million) for a 25-year life of mine with operating costs of ZAR2,393/t pig iron and ZAR47/kg FeV.

The Definitive Feasibility Study (DFS) followed on in April 2014 and which assessed the economic viability of this pig iron and ferro-vanadium project consisting of a 15MW DC smelter with planned production of 41,966tpa of high purity iron, 415tpa of vanadium (in slag) and 8,269tpa of titanium (in slag) from late 2015. The DFS confirmed the project's viability to deliver an exceptionally high-grade iron product (99.5% Fe) called HPI which commanded a premium to the pig iron price. Project life was seen to be in excess of 100 years and highly scalable. **The DFS showed the ability of the project to deliver an annual turnover of £26.4 million with an EBITDA of £8.1 million per annum (based upon then current costs and commodity values).** Capex was projected to be approximately £36 million, a proportion of which was modelled to be funded out of early cash flow.

During 2016 and 2017, the company focused on achieving key milestones that would enable Ironveld to move towards financial closure. This included securing the Mining Licence, environmental approval and receiving confirmation from Eskom for power supply. At that time, offtake demand for all three products was reported to be strong with multiple offers being considered. Such negotiations ran in parallel with financing discussions and investors waited with bated breath for the board to progress the project through financing and into the construction stage later in 2017. The story is that potential offtakers would not sign an offtake agreement unless they were in production and funders would not provide finance unless there was an offtake agreement. It was case of catch 22 or rather catch nothing.

The planned acquisition of a smelting business was announced in April 2017. This deal involved taking a 100% interest in Siyanda Smelting, a company which owned a smelting plant comprising three arc furnaces and two induction furnaces, a convertor and associated equipment with a smelting capacity of 7.5MW. On top of this, the deal came with a 70% stake in Power Alt which owned an independent power producing plant which generated 10.6MW of electricity through four natural gas-powered engines.

Acquiring the smelter and associated power plant were seen as enabling early production of HPI, vanadium and titanium from the project and providing supply into the company's offtake agreements. These transactions were heralded as providing the company with a ready made smelter that was expected to deliver highly attractive economic returns and early free cash flow whilst providing the platform for organic growth. The smelter and power generating plant are located in Middelburg, South Africa which is some 300 kilometres from the project.

Since then, with the transaction uncompleted, the stock market had fallen out of love with Ironveld. Over recent times there has seemingly been little progress made and with rapidly dwindling funds the share price has been very much under the weather. In pursuit of generating value for shareholders, the company announced a strategic review in July 2019. This process was led by brokers FinnCap which helped review the strategic alternatives for the company's mining assets given the potential size of the resource that was starting to be outlined. This move was followed by some board room changes which in December 2019 saw Martin Eales appointed as CEO.

In March 2020, Ironveld announced a strategic partnership with Inclusive Investment Group (IIG) which could have led to some £2.7 million being invested in the company with IIG taking a 36% stake. This move was planned to see IIG use its extensive proven African connections to secure the larger scale funding to develop the company's flagship project. But this proved to be a bit of a false dawn as by late-November 2020, it became clear that this arrangement was not going to deliver the required outcome. So, the board sensibly moved to assure the company's future with a £1.15 million funding at 0.3p which provided the working capital for 2021.

Operations

Ironveld has a 100% interest in a Bushveld Magnetite deposit which will produce HPI, vanadium and titanium products, located on the Northern Limb of the Bushveld Complex in Limpopo Province in South Africa.



Location of Ironveld's project and the 7.5MW smelter. Source: Company

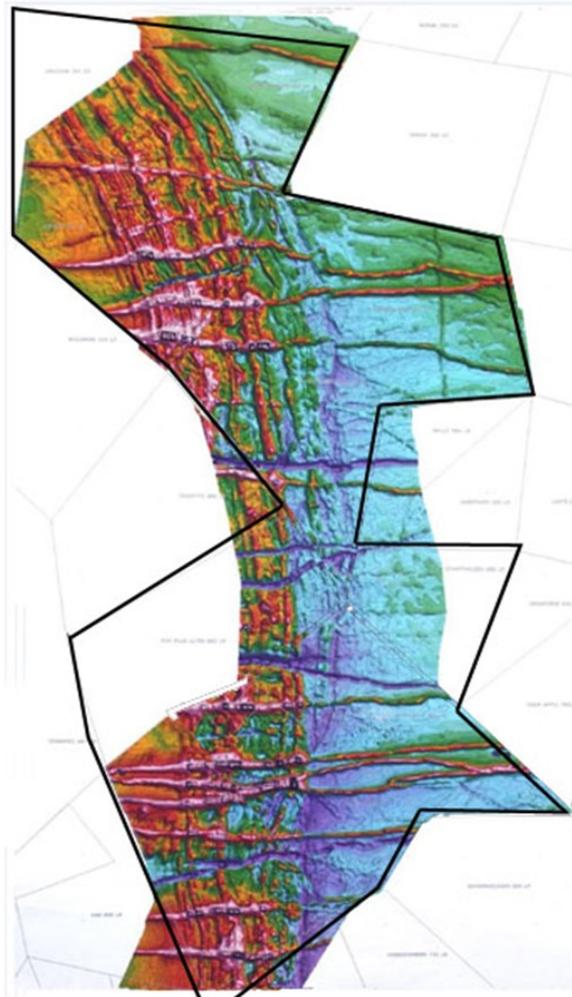
The Bushveld Complex is a metallogenic province which covers an area of 66,000km² in the north of South Africa. The Bushveld is the largest igneous intrusion within the earth's crust and is regarded as the most valuable mineral province on the planet. Over 2.1 billion years the structure has been tilted and eroded which has served to form outcrops around the edge of a great geological basin called the Transvaal Basin. The Bushveld is divided into four different limbs: the northern, southern, eastern and western limbs and has been found to hosts many mineral deposits including platinum group metals, vanadium, chrome, palladium and rhodium. Many have been developed to become company making mines.

JORC Resource

Ironveld's undeveloped and unique project covers a shallow mineralised zone which has a JORC-compliant resource of 56.4 million tonnes (Mt) grading at 68.6% Fe₂O₃, 14.7% TiO₂ and 1.12% V₂O₅ was delineated in 2013 for the project.



Drilling on the project area to delineate a JORC resource. Source: Company



| MML Mineral Resources¹ for the Ironveld Project, <120m at 20% Fe cut-off as at 04 July 2013. | | | | | | | | | | | |
|---|--------------------|--------------|---------------------------------|-------------|--------------------------------------|--------------------|--------------------------|-------------------------------------|--------------------------|-------------------------------------|-------------|
| Farm Name | Cut-off Fe% | Mt | Density g/cm³ | Fe % | Fe₂O₃ % | Fe metal Mt | TiO₂ % | V₂O₅ % | SiO₂ % | P₂O₅ % | S % |
| Measured Mineral Resources | | | | | | | | | | | |
| Altona | 20 | 2.18 | 4.55 | 51.7 | 73.9 | 1.13 | 16.3 | 1.15 | 2.9 | 0.01 | 0.08 |
| Total Measured | 20 | 2.18 | 4.55 | 51.7 | 73.9 | 1.13 | 16.3 | 1.15 | 2.9 | 0.01 | 0.08 |
| Indicated Mineral Resources | | | | | | | | | | | |
| Nonnenwerth | 20 | 22.64 | 4.20 | 45.2 | 64.7 | 10.24 | 13.8 | 1.06 | 8.5 | 0.01 | 0.16 |
| La Pucella | 20 | 5.61 | 4.50 | 50.3 | 72.0 | 2.83 | 15.5 | 1.16 | 4.4 | 0.01 | 0.08 |
| Altona | 20 | 7.48 | 4.54 | 51.4 | 73.6 | 3.85 | 15.9 | 1.15 | 3.2 | 0.01 | 0.08 |
| HACRA Farms | 20 | 12.12 | 4.31 | 48.1 | 68.8 | 5.83 | 14.5 | 1.14 | 6.0 | 0.01 | 0.05 |
| Total Indicated | 20 | 47.85 | 4.31 | 47.5 | 68.0 | 22.74 | 14.5 | 1.11 | 6.6 | 0.01 | 0.11 |
| Inferred Mineral Resources | | | | | | | | | | | |
| HACRA Farms | 20 | 6.31 | 4.45 | 50.1 | 71.7 | 3.16 | 15.4 | 1.21 | 4.2 | 0.01 | 0.03 |
| Total Inferred | 20 | 6.31 | 4.45 | 50.1 | 71.7 | 3.16 | 15.4 | 1.21 | 4.2 | 0.01 | 0.03 |
| Measured, Indicated and Inferred Mineral Resources | | | | | | | | | | | |
| Project Total | 20 | 56.35 | 4.34 | 48.0 | 68.6 | 27.03 | 14.7 | 1.12 | 6.1 | 0.01 | 0.10 |

¹ geological loss factors of 5% for Altona and La Pucella 8.5% for Nonnenwerth and 2% for HACRA applied

MML Mineral Resources at Ironveld's HPI, vanadium and titanium project as at 4th July 2013.

Source: Company

Definitive Feasibility Study

The 2013 JORC resource formed the basis of a Definitive Feasibility Study (DFS) which was published in April 2014 and confirmed the project's potential to deliver an exceptionally high-grade iron product at 99.5% Fe (HPI) which has a premium price in the market. The 56.4Mt ore grading at 1.12% V_2O_5 represented almost double the grade of other vanadium resources that were currently being mined and processed within the Bushveld Complex.

The DFS assessed the economic viability of the company's pig iron and ferro-vanadium project which will consist of a 15MW DC smelter with planned production of 41,966t of HPI, 415t of vanadium in slag and 8,269t of titanium in slag per annum from late 2015. **The project life was deemed to be in excess of 100 years and highly scalable.** The capital costs came out at US\$56 million (based on a Rand-Dollar rate of 15) and the study showed that the project would become cash flow positive from full production. By-product credits were seen to significantly reduce the already low cash costs.

The project at that stage was seen as mining ore from the main magnetite layer which could be fed directly to the proposed smelter without the need for beneficiation. 20MW of power was planned to be available on site by year-end 2014 from an Eskom substation adjacent to the project area. **The DFS demonstrated that the project could deliver annual turnover of £26.4 million and EBITDA of £8.1 million based upon the then current costs and metal prices.**

Three-stage development programme

Over the intervening years Ironveld's project has been reimagined as an enhanced three-phase development project where Phase 1 would allow the operation to commence with relatively modest capex that might be successfully funded by a company of Ironveld's size.



Middelburg 7.5MW smelter. Source: Company

Phase 1 is a near-term opportunity which is provided by the possible acquisition of an existing 7.5MW smelter, where details of a potential acquisition deal were agreed 3 or 4 years ago. The board has a number of alternatives to getting into production, one of which is to construct a 5MW plant on site. Obviously going this route would take longer to get into production with all the usual Eskom risks concerning a power supply and throughput will be lower than 7.5MW plant; however there would be negligible transport costs.

Phase 1 Production Plan

Once the required US\$20 million finance is in place to start the mine, as well as buy and refurbish the smelter, production can begin. A smaller contract mining fleet is planned to mine quite a low target of 44,000tpa with projected annual production of 21,000t of HPI powder, 190t of vanadium slag grading 28% V₂O₅ and 3,818 tons of titanium slag grading 65% TiO₂. With production at this level and based on current metal prices, the annual revenue should be around US\$28 million. Discussions are currently reported to be underway with potential funding partners.

Already there is a five-year offtake agreement for the vanadium slag with a globally recognised trading company. Previously there were marketing agreements for the HPI powder and titanium slag, with a five-year contract signed with Oreport, an established South African marketing company with expertise in commodities, steel and stainless steel.

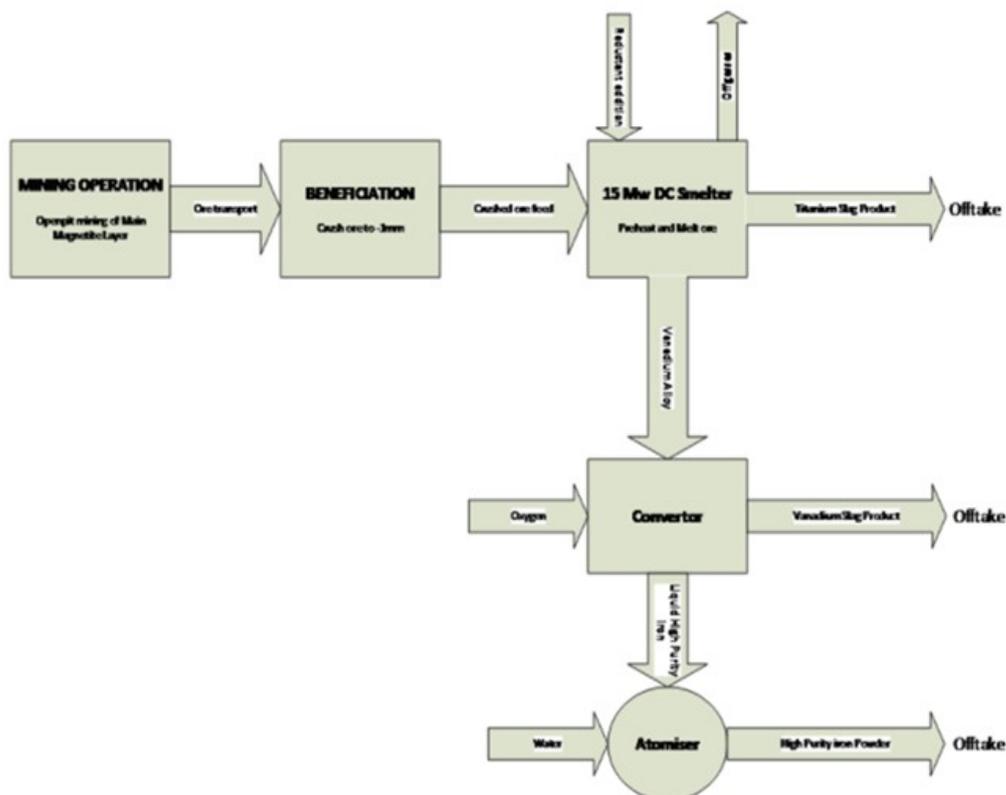
Smelter refurbishment and commissioning is to be managed by highly reputable company Tenova Pyromet, which is a leader in the design and supply of AC & DC furnaces for the production of ferroalloys, PGMs, base metals, slag cleaning and alloy refining.

Phases 2 & 3

Phase 2 looks pretty well akin to the DFS of 2014 and is now seen as the medium-term opportunity. Here, the initial project would be scaled up with the construction of a 15MW smelter located next to the mining area. This would replace the Middelburg Smelter and allow for a doubling of production. Phase 3 is the long-term objective which involves adding four 75MW smelters which are really necessary to process the large resource at the project over a meaningful time period.

Smelting process

Ironveld will be employing a special three-stage smelting process to extract HPI, vanadium slag and titanium slag from magnetite ore. In the first stage, the run of mine ore is crushed to size and fed directly into the DC furnace along with coke and fluxes before being heated to 1,600°C. This serves to turn the iron and vanadium into metal in a vanadium-bearing iron melt that is greater than 65% TiO₂ which is the rich titanium slag product.



The smelting process. Source: Company

The second stage sees the vanadium-bearing iron being converted by blowing oxygen whilst carefully controlling the temperature to ensure that vanadium is oxidised into slag (26% V₂O₅ slag product). This is followed by the removal of carbon in the second part of the converting process, which results in a 99.7% HPI melt product. The third stage involves HPI melt being fed into a water atomizer to produce metal powder.

Although, Ironveld has a five-year offtake agreement for vanadium slag, in the fullness of time, the further processing of this slag (20-30% vanadium) might be considered. Vanadium slag is traditionally put through a salt roast process or roast-leaching process which is a classic secondary production process.

This process begins with titaniferous magnetite ore being finely crushed and milled down to micron size which is followed by sodium salt being added to form water-soluble sodium vanadate which then roasted in a kiln. The resultant material is then leached using water creating a pregnant solution which is precipitated by adding ammonium chloride to form ammonium metavanadate (AMV).

The AMV is a saleable product and there is a market for it. But normally vanadium producers like Glencore's Rhovan operations and Bushveld Vanadium (AIM:BMN) complete a couple more basic chemistry stages which involve more calcination where the AMV is heated up to create high purity vanadium pentoxide (V_2O_5) flakes.

Strategy for growth

Time looks as though it has stood still at Ironveld for the last three or four years. So, it's little surprise that the stock market fell out of love with the company and the share price dropped to uncharted depths. The end result is that the company has raised £1.15 million at a shell company type valuation of £2 million despite there being tremendous potential. All the signs are that the company is now making a brand-new start. **The November 2020 financing basically cleared the decks of accruals and has given the board the proper breathing space of probably around twelve months to do a deal to finance the Phase 1 project into production. This time around there looks like a real desire to do a deal. Truth is there probably will not be any more chances.**

Ironveld has a hugely exciting asset. The company sits on a unique project located on the Northern Limb of South Africa's awfully rich geological marvel, the Bushveld Complex. This project has a JORC-compliant resource of 56.3Mt grading at 68.6% Fe₂O₃, 14.7% TiO₂ and 1.12% V₂O₅. **When in operation, this should attract a lot of attention as it would be the first project in South Africa that is capable of producing HPI, vanadium and titanium.** On top of that, Ironveld has a truly tremendous competitive advantage when it comes down to HPI production. Not only does the project have established infrastructure, but also globally recognised offtake partners for all three products for the first five years of the mine's life already in place. The way things stand at the moment, Ironveld's project has huge potential that is ready to be unlocked by a near-term financing.

The board let the IIG deal lapse. Freeing themselves from IIG's clutches has certainly put the company back in play and interested parties have already begun knocking on the door. The likely structure of any such financing of a new deal could be another strategic partnership taking a stake and securing finance (but once bitten twice shy), traditional project finance or a direct investment equity at asset level into the project

The main hurdle to most investors understanding Ironveld is that this is not gold or copper where there is a commodity price posted on a screen. Here, the project will not be supplying a standard product with obvious transparency but where prices are instead agreed on a long-term contract basis. HPI powder might be sold at US\$1,700/t but it is a specialist market dominated by five majors. At the same time the project has an offtake agreement for vanadium with one of the big reputable names (so if a vanadium player showed an interest, they would need to have a discussion with them). The ore grading at 68.6% Fe₂O₃, 14.7% TiO₂ and 1.12% V₂O₅, is all mined together with everything going through the mill at the same time, with vanadium and titanium providing valuable by-product credits.

The major producers of HPI could be counted on the fingers of one hand - GKN, Rio Tinto, Kobelco and JFE Steel Corp. Apart from Rio Tinto Metal Powders (formerly QMP), these big manufacturers do not have captive mines so do not mine the ore. Instead, these HPI producers buy in scrap stainless steel and stainless steel. Such offcuts of stainless steel typically account for up to 70% of their production costs. Ironveld has a real competitive advantage here as it is cheaper to mine rather than grinding up stainless steel. In addition, the company's HPI does not have the impurities seen in stainless steel as it has not been processed. **Having its own captive mine represents a big competitive advantage which should firmly place Ironveld in the lowest quartile of the HPI cost curve. Better than that, quite possibly, when by-product credits have been taken into account then the company may be the world's lowest cost HPI producer.**

Vanadium is seen to be the metal that will soon be powering neighbourhoods in the west as vanadium redox flow batteries have been seized on as being the most sustainable and advanced technology available for large scale energy storage. It could be the prime choice for the big batteries used to store electricity that has been generated by solar and wind farms, a rapidly growing and large global market. Certainly, investors have got fairly excited about Bushveld Minerals, the integrated primary vanadium producer and energy storage company which now has an Enterprise Value of £200 million. **Ironveld's 56.3Mt at 1.12% V₂O₅ compares favourably with BMN's attributable Mineral Resource of 138.1Mt at 0.78% V₂O₅ from its Vameto Mine which is not currently making any money.** However, to turn Ironveld into a pure vanadium play would need 2-3 years' work on the necessary environmental approvals plus 20MW of power generation on site. Ironveld has not taken the route of majoring on vanadium because traditional vanadium project economics do not work, although a vanadium investor/joint venture partner might want to prove them wrong.

In Phase 1 of mining at a rate of 44,000tpa, it would take 25 years to mine just 1Mt of Ironveld's 56Mt JORC-compliant resource in the Bushveld, leaving 98% of the resource untouched. **So, the resource is crying out for a far larger project that could really begin to do justice to the tremendous potential and that is where Phase 2 and Phase 3 come in.** Given the delays, it is important that the company just gets started. To begin developing the mine and buying the Middelburg smelter or the alternative of Ironveld building its own 5MW on site will require a similar sort of capex of R300 million (US\$20 million or £15 million). The original deal for buying the Middelburg smelter was R188 million (US\$12 million or £9 million) but it remains to be seen if the deal can still be concluded. The acquisition of the smelter would provide an enviable opportunity to not only de-risk the project but also offer the potential for production in 6-9 months, together with the prospect of the project being cash generative within the first year of production.

South Africa is notorious for power shedding (blackouts) so it is an important advantage that the smelter has a gas-powered generation arm attached. In this way the power is provided independently of the country's state power company state Eskom. In addition, there is excess power which could be sold to other users which opens up the opportunity of partnering up with a group which needs the power. So, Phase 1 is a £15 million deal and beyond that the sky is the limit. Phase 2 has the 15MW smelter onsite (with no transport of the ore required) which is based on power that Eskom says it can provide. Phase 3's power requirements could not possibly be met by Eskom at the current time.

Although the purchase of the Middelburg smelter or constructing a smelter on site is still the prime strategy, there is a growing opportunity for even earlier cash flow at this project. Magnetite ore could be simply dug up, crushed and without any further processing and sold for use in dense media separation (DMS). In this process the magnetite, slurried in water, creates a heavy medium in which fine coal is cleaned of its mineral impurities. Such a DMS scheme could be in production within three months of entering a joint venture. The level of production is customer dependent but maybe 15,000-20,000tpa could be expected with the first one but could be expanded. Either this would be all contract mining, or the capital costs would be borne by the other party. **At a selling price around the \$100/t mark, it could generate some handy cash flow which would give the company more breathing space and the time to do a better financing deal. It does look as though it is all starting to come together at Ironveld.**

Financials & current trading

Ironveld's results over the years mainly show expenditure on progressing its HPI, vanadium and titanium project in the Bushveld Complex along with other administrative expenses.

| 12 months ending 30 June £ '000s | 2016 | 2017 | 2018 | 2019 | 2020 |
|-------------------------------------|-------|-------|-------|-------|---------|
| Revenue | - | - | - | - | - |
| Pre-tax profit (loss) | (585) | (737) | (536) | (625) | (1,019) |
| Net profit/(loss) | (585) | (737) | (536) | (625) | (1,019) |

Ironveld's five-year trading history. Source: Company accounts

2020 results

Financial results for the twelve months ended 30th June 2020 covered the period when a Strategic Review launched (July 2019) which resulted in option agreement and strategic partnership for up to US\$3.2 million, although following the end of the period, it was agreed that the option agreement would lapse.

In the 12-month period, administration expenses were £0.695 million, which resulted in an operating loss of £0.695 million. There was a total of £0.326 million of other losses which resulted from the impairment of other investments. After little in the way of investment revenues and financing costs, the company reported a loss before and after tax of £1.019 million. The loss per share attributable to the owners of the company was 0.16p.

Recent developments

In March 2020, Ironveld announced a strategic partnership with IIG which could have led to some £2.7 million being invested in the company with IIG taking a 36% stake. This move was planned to see IIG use its extensive proven African connections to secure the larger scale funding to develop the company's flagship project.

However, despite the timetable for IIG's assistance being extended, the deal did not eventually provide the expected outcome. In late November 2020, the company announced the raising of a total of £1.15 million at 0.3p per share, plus the capitalisation and repayment of outstanding debt. Together with the available cash resources, the board was able to point out that the company would have sufficient cash resources to fund operations into the first half of 2022.

Risks

Geological risks

There are a series of risk factors concerning the amount of understanding of the geology of the project areas, the mineralisation being targeted and the distribution and grade of HPI, vanadium and titanium.

Political risk

There are political risks involved in companies operating in South Africa.

Metal price risks

HPI, vanadium and titanium are relatively small metal markets and as such maybe susceptible to rapid changes in the balance between supply and demand resulting in volatile price movements.

Exchange rate risks

The company's accounts are in pounds, with HPI, vanadium and titanium being priced in US dollars and local costs in South African rand. Fluctuations in the value of the pound against US dollar, South African rand may have an effect on the valuation that Ironveld is awarded by the UK stock market.

Future funds

The market for raising funds for small cap resources companies has not been easy over recent years and has worsened by the spread of the COVID-19 pandemic. Some recent fund raisings in the resources sector have seen share prices being undermined by incoming investors demanding substantial discounts to provide the necessary capital.



Corporate social responsibility is an integral part of Ironveld's business. Source: Company

Board

Martin Eales – Chief Executive Officer

Martin previously held the position of CEO at London listed Rainbow Rare Earths Limited from 2014 to 2019, where he oversaw the development of the company into the only rare earths producer in Africa. Prior to that, Martin enjoyed a 15-year career in the City of London rising to the role of Managing Director at RBC Capital Markets with a strong track record advising natural resource companies on fundraisings and other corporate transactions. He is also a qualified Chartered Accountant.

Dr Peter Cox – Technical Director

Peter started his career in the mining industry 30 years ago as a learner surveyor. After studying mining engineering as a JCI bursar, he worked for that company in various positions at gold and platinum mines, ending as a senior section manager. In 1987, Peter joined a privately owned mining and exploration company, Severin Southern Sphere Mining, as consulting engineer and general manager. Since mid-1991 he has been the managing director of Goldline Global Consulting (Pty) Ltd, an engineering consulting company which serves the mining industry worldwide. Peter holds a Mine Surveyor's and a Mine Manager's Certificate of Competency. He has a number of achievements to his name, including being the youngest certificated surveyor in South African mining history and designing the country's narrow reef opencast mining method.

Giles Clarke – Non-Executive Director

Giles is Chairman of Westleigh Investments Holdings Limited and Kazera Global plc, as well as Chairman of several private organisations. He founded Majestic Wine in 1981 and built it into a national chain of wine warehouses. Giles also co-founded Pet City in 1990, which he expanded nationwide before it was listed and subsequently sold in 1996 for £150 million, co-founded Safestore which was sold in 2003 for £44 million and was Chairman of Amerisur Resources plc, sold for £242 million in 2019. Giles was Chairman of the England and Wales Cricket Board from 2007-15 and a Director of the International Cricket Council from 2007-18.

Nick Harrison – Non-Executive Director

Nick is a Chartered Accountant, having qualified with Arthur Andersen and subsequently held senior positions at Deloitte, Midland Bank (International) and Coopers and Lybrand. He has held board positions at a number of public and private companies with international activities. Nick was CFO of Pet City during a period of rapid growth prior to its sale for £150 million and of Amerisur Resources plc in a similar period of expansion prior to its disposal for £242 million. He is currently Chief Executive of Westleigh Investments and a non-executive director of Kazera Global plc. Nick brings considerable commercial, international and financial expertise to the Board.

Management

Thamaga Mphahlele – Chief Executive Officer (Ironveld Smelting)

Thamaga is a registered professional Electrical Engineer and a member of the South African Institute of Electrical Engineers (SAIEE). He holds a MEng (Electrical) and BSc Engineering (Electrical) both from the University of the Witwatersrand. Thamaga joined Ironveld in 2015 as a Senior Electrical Engineer and is the designate CEO Smelting. He started his career at Eskom in 2009 as an Engineer-in-Training being appointed in 2010 as an Electrical Engineer for overhead distribution systems technologies.

Tariro Chitapa – Manager: Marketing and Logistics (Ironveld Holdings)

Tariro holds a B.Com in Marketing Management from the University of South Africa and a qualification in Logistics and Supply Chain Management from the University of Witwatersrand. Prior to joining Ironveld in 2012, Tariro was employed as a marketing and public relations manager. At Ironveld, Tariro's responsibilities include, in addition to marketing and logistics, corporate social responsibility (CSR).

Empowerment Partners

Ironveld is fully Broad-based Black Economic Empowerment (BBBEE) compliant.

Pinky Ngxulelo – Managing Partner

Pinky is a Director of Epibex Pty Ltd. She has worked for Thebe Investments, a company that came into being shortly before South Africa's formal political transformation. She has also worked as National Peace secretariat which was tasked with Democratising public participation in peace-making. This was in preparation for the first democratic elections. Pinky serves as a consultant to Ironveld in regard to Municipal and Government engagements as well as co-ordinating the local communities in the project area. She serves as the Managing Director of Ironveld's B-BBEE partner companies.

BBBE Partner Companies

- Sequon – Harriets Wish, Cracouw and Aurora communities
- Cucrat – Nonnenwerth, Lapucella and GaTshipana communities
- Luplus – GaRamela community
- Ironveld Smelting BBBEE Company

Forecasts

We initiate coverage of Ironveld with forecasts for the financial years ending 30th June 2021 and 2022. The year ending 30th June 2021 is expected to include news of a joint venture on the mining of the magnetite ore to be crushed and then supplied to customers. Although such an operation could be established quite rapidly, it is anticipated that the initial production and certainly the first cash flow is more likely in the early months of the company's financial year ending 30th June 2022. We forecast administration expenses of £0.600 million resulting in a similar operating loss. The loss before and after tax comes out at £0.592 million as no tax is assumed to be paid. On this basis the loss per share would be 0.06p.

For the year ending 30th June 2022, we think that the magnetite ore operation is in progress for the full twelve month period and produces some 15,000tpa which is sold for US\$100/t. This is assumed to be a joint venture where either Ironveld's partner provides the capital equipment or the use of contracting mining. The company share of revenue is forecast to amount to £0.556 million which after operating costs of £0.22 million and £0.600 million of administration costs would result in an operating loss of £0.258 million. With no tax payable the loss before and after tax comes out at £0.258 million. For this year the loss per share equates to 0.02p.

| Year End 30 June (£'000s) | FY2019a | FY 2020a | FY 2021e | FY 2022e |
|---|-------------|-------------|---------------|---------------|
| Revenue | - | - | - | 556 |
| Operating costs | - | - | - | (222) |
| Administrative expenses | (629) | (695) | (600) | (600) |
| Operating loss | (629) | (695) | (600) | (266) |
| Other gains and losses | - | (326) | - | - |
| Investment revenues | 6 | 4 | 10 | 10 |
| Finance costs | (2) | (2) | (2) | (2) |
| Loss before tax | (625) | (1,019) | (592) | (258) |
| Tax | - | - | - | - |
| Loss for the year | (625) | (1,019) | (592) | (258) |
| Attributable to: | | | | |
| Owners of the Company | (624) | (1,017) | (591) | (257) |
| Non-controlling interests | (1) | (2) | (1) | (1) |
| Loss per share - Basic and diluted (pence) | (0.10) | (0.16) | (0.06) | (0.02) |
| Weighted average number of shares | 602,782,339 | 654,990,841 | 1,070,647,127 | 1,346,988,317 |
| Total shares plus options and warrants | 669,469,450 | 712,839,550 | 1,440,122,314 | 1,440,122,314 |

Source: Company/Align Research

Valuation

To determine a valuation for Ironveld and a target price which makes sense in the current market, we sought to value Phase 1, for which the company has developed some impressive modelling, as well as place a relevant valuation on the remaining resource.

Phase 1

A financial model was developed to cover the initial phase of the development of this large HPI, vanadium and titanium project based on the refurbishment of the Middleburg 7.5MW smelter as has been described earlier on in this report. This model was based on information contained in the company's announcements, presentations and discussions with management, as well as sight of the company's financial model for Phase 1. Below we set out some of the assumptions made.

Mining plan - The initial phase of the project has been modelled assuming a 44,000tpa run of mine production and in-situ metal grades of 50.820% iron, 0.65% vanadium and 9.659% titanium.

Timing – A ten-year period was modelled with the refurbishment of the Middleburg 7.5MW smelter in Q1 and Q2 year 1, commission and production build up in Q3 and full production in Q4.

Smelter production - Full production would result in 21,000tpa of HPI powder, 190tpa vanadium in slag (28% V₂O₅) and 3,818tpa of titanium in slag (65% TiO₂).

Product prices - There is no other producer of HPI powder in South African and the company has been using a figure of US\$1,350/t in its modelling which is all well and good. Our analysis suggests that products made to such specifications can achieve more than US\$1,700/t – which is a flat figure we have chosen to use over the 10-year period that we have modelled. The flat prices are also used for the other two products which are also based on current prices, with vanadium in slag at US\$5,500/t and titanium in slag US\$250/t.

Capital expenditure – In all, capex has been assumed to be ZAR300 million (US\$20 million). Apart from the cost of acquiring the 7.5MW smelter, there is also the cost of refurbishing the smelter, mine establishment costs along with mining and smelter working capital. It is also assumed that the ZAR300 million is financed over three years at an annual interest rate of just over 10%.

Operating costs – Once full production is achieved, the operating cost is forecast to total around ZAR7,500/t (US\$501/t) which includes mining (ZAR102/t or US\$6.80/t,) smelting (ZAR413/t or US\$27.50/t) and depreciation & amortisation of ZAR236/t or US\$15.70/t).

Revenue – Annual revenue once full production is reached is forecast to be ZAR710 million (US\$47.3 million) which is made up of iron (HPI) ZAR683 million (US\$45.5 million), vanadium (slag) ZAR11 million (US\$0.73 million) and titanium (slag) ZAR16 million (US\$1.1 million).

Exchange rate - ZAR/US\$ of 15.0 for the life of the project.

Based on our above assumptions, the Net Present Value was determined at a discount rate of both 10% and 12%. Although discount rates of 5%, 8% and 10% are commonly used to evaluate projects, to remain conservative we have chosen a 12% discount factor, which gives an NPV(12) of £46.54 million.

| Discount rate | NPV | | |
|---------------|-------------|--------------|-----------|
| | ZAR Million | US\$ million | £ million |
| 10% | 1,071.36 | 72.00 | 53.33 |
| 12% | 934.90 | 62.83 | 46.54 |

Net present values generated by the model for Phase 1. Source: Align Research

Although using the higher discount rate already serves to risk Ironveld's HPI project, to remain conservative we have further risked the project. A commonly used rule of thumb valuation method suggests that at the DFS stage should attract a current valuation of between 45-55% of the NPV. We have adopted a mid-range figure which results in a risked NPV(12) of £23.27 million.

Remaining resource

When Phase 1 has been running for 10 years, it will have only mined less than 1% of this large resource. On this basis, it is important to place some valuation on the remaining resource. This has been achieved by peer comparisons to determine a price per tonne in the ground.

TNG Limited (ASX:TNG) is an Australian resource and mineral processing technology company which owns (100%) the Mount Peake Vanadium-Titanium-Iron in the Northern Territory, Australia. The mine site is located some 230 km north of Alice Springs right in the heart of Australia and the project has a JORC Measured, Indicated and Inferred Resource totaling 160 Mt, grading 0.28% V₂O₅, 5.3% TiO₂ and 23% Fe.

TNG sees itself as the most advanced vanadium project globally and is currently focusing on Front-End Engineering & Design (FEED) and Non-Process Infrastructure (NPI) works in order to progress to an Engineering, Procurement & Construction (EPC) proposal. In September 2019, the company released an optimised delivery strategy and revised mine schedule which is based on an initial production rate of 2Mtpa corresponding to 100,000tpa of titanium dioxide pigment. On the basis of TNG's refined delivery strategy, the forecast pre-production capex is A\$824 million, with an IIR of 33%, an NPV(8) of around A\$2.8 billion and a payback period of 2.8 years.

In search of adding value, TNG has sought to become vertically integrated, from production to market. Recently, the company was able announce that it had established a new Vanadium Redox Flow Battery (VRFB) business unit as part of its vertical integration strategy. This move involves using its proprietary TIVAN[®] technology designed with German metallurgical plant supplier and development partner, SMS Group, to produce very high-purity vanadium pentoxide, titanium dioxide and iron oxide.

TNG sees TIVAN[®] as a breakthrough in high-purity product development, with the TIVAN[®] processing facility located 10km from Darwin. TNG has off-take agreements in place for vanadium pentoxide and titanium dioxide.

An equivalent iron (Fe) grade for LNG's Mount Peake Project resource was determined based on the JORC resource grade and price per tonne assumed in our financial model for Ironveld's Phase 1 operation i.e. HPI US\$1,700/t, vanadium in slag (28% V₂O₅) US\$5,500/t and titanium in slag (65% TiO₂) US\$250/t. On this basis the iron equivalent grade came out at 27.18% which equates to 43.48Mt of Fe equivalent (Fe Eq). At the current market price of A\$0.091, TNG has a market capitalisation of £63.1 million and an Enterprise Value (EV) of £58.3 million which suggests an EV per tonne value of £1.34 (US\$1.81/t).

Ironveld's undeveloped and unique project covers a shallow mineralised zone which has a JORC-compliant Resource of 56.4 million tonnes (Mt) with 68.6% Fe₂O₃ (for 27.03Mt of Fe) with 14.7% TiO₂ and 1.12% V₂O₅. After allowing for 10 years of 44,000tpa production, Ironveld's Fe Eq grade on the same basis came out at 61.30%, which equated to 34.28Mt. Using **the TNG derived EV per Fe Eq figure of £1.34 suggests that the company's asset could be awarded an EV of £45.95 million.**

TNG is clearly at a more advanced stage of development, being involved in FEED etc., and has made significant progress towards its vertically integrated strategy going down the VRFB route. However, it is still at the feasibility studies stage. Ironveld is also at the DFS stage, which was achieved in 2014. However, to remain conservative, we have decided to risk the EV figure of £45.95 million by 50%. This gives £22.98 million, a figure which has been carried forward into our SOTP table, although there are plenty of good reasons to risk this project less harshly.

Total

| Asset | Valuation £ million |
|---|------------------------|
| Phase 1 NPV(12) risked 50% | 23.27 |
| Remaining resource valued by peer comparison risked 50% | 22.98 |
| Sub-total | 46.25 |
| Per share | |
| Based on the number of shares in issue (1,298,940,372) | 3.56p |
| On a fully diluted basis | |
| Funds raised by the warrants and options being exercised | 0.74 |
| Total | 46.99 |
| Based on the number of shares on a fully diluted basis (1,440,122,314) | 3.26p |

Sum-of-the-parts valuation. Source: Align Research

The total valuation for the company came out at £46.25 million, which equates to 3.56p per share based on the current number of shares in issue (1,298,940,372). On a fully diluted basis (1,440,122,314 shares) the valuation increases to £46.99 million (following the receipt of warrant and option proceeds), which would give a per share valuation of 3.26p, which we have adopted as our target price.

Conclusion

Ironveld's project comes with near, medium and long-term opportunities where cash flow and earnings could rapidly build to a crescendo. In the near-term there is the opportunity of acquiring an existing 7.5MW smelter which could be in production and generating early cash flow within 12 months. This includes a 6-month refurbishment of this mothballed plant. A quick start looks possible as Ironveld already has an MOU in place to acquire the smelter. Phase 1 production at current prices equates to an annual revenue of something like US\$28 million. It might be quite small scale but could be highly profitable with open pit mining, using a simple truck and shovel operation at this shallow deposit. All it needs is a near-term financing deal to rapidly begin to unlock the project's tremendous potential.

In the medium-term, there is the opportunity to construct a new 15MW smelter which would allow mining and production to double, that is Phase 2. Importantly, the 7.5MW smelter plan allows for proof of concept ahead of the company building its own 15MW smelter. There is no doubt that robust cash flows support efficient financing of project development. This is just the start, as the long-term objective (Phase 3) is to add four 75MW smelters to process the large resource at the project. But for now, it is important that Ironveld just gets started.

All the signs are that 2021 could be a very exciting year for Ironveld as management have got to do something. **There does seem to be the planning of a relaunch which should serve to remind investors about the awesome potential of the company's assets. There should soon also be news on the third mining licence.** Basically, the asset is split into three and two parts have a mining licence. The third part has had a prospecting licence for five years and the team will be applying for a mining licence which involves submitting an environmental study in early 2021. **Moving from a prospecting licence to a mining licence would be a significantly value enhancing move, which should ultimately be reflected in the share price.**

Given the highly attractive potential that we clearly see here, it looks to be on the cards that the board will be able to announce ongoing negotiations with various interested parties on a value enhancing transaction. Plus, there is a good chance of news on the DMS mini project coming about. A joint venture here could lead to the rapid start of simple mining and crushing of the magnetite ore with a third party. As we have seen with Kazera Global, it is amazing how investors can react on the sight of real cash flow coming in – suddenly the stock market starts believing in you again. All this potential comes with a highly experienced board and senior management team based in South Africa and the UK who are no strangers to pushing projects rapidly up the valuation curve.

We initiate our coverage of Ironveld with a Conviction Buy stance and an initial target price of 3.26p.

DISCLAIMER & RISK WARNING

It is the policy of ALIGN Research to only cover companies in which we have conviction in the investment case. Our “Conviction Buy” recommendation is derived from our conviction in either taking equity as payment for our research services, or applying our fee to the purchase of equity in a covered company whilst absorbing the cash cost of our freelance analyst payments. Ironveld is a research client of Align Research. Align Research & a director of Align Research own shares in Ironveld. Full details of our Company & Personal Account Dealing Policy can be found on our website <http://www.alignresearch.co.uk/legal/>

ALIGN Research has made every reasonable effort to ensure the accuracy of the information in our research reports and on our website, although this can not be guaranteed. Our research reflects the objective views of our team of analysts. As we actively seek to take the majority of our fees by the way of equity payment in the companies we cover, we believe that we are aligned with both investors and the subject company. Additionally, we only write about those companies that we have conviction in. However, as a consequence of this alignment, our vested interest is in an increase in value of the subject company’s equity. As such, we can not be seen to be impartial in relation to the outcome of our reports.

ALIGN Research has both a personal & company dealing policy (covering staff & consultants) in relation to the dealing in the shares, bonds or other related instruments of companies that we follow & which adhere to industry standard personal account dealing (PAD) rules. ALIGN Research may publish follow up notes on these securities/companies but has no scheduled commitment and may cease to follow these securities/companies without notice. Our reports are not subject to any prohibition on dealing ahead of their dissemination by staff members. Additionally, you should assume, given that we look to take our fees almost wholly in equity, that Align will actively manage its cash position, not least for general administration and taxation purposes and that equity divestments will take place as and when we deem, in our sole discretion, it appropriate.

Your capital is at risk by investing in securities and the income from them may fluctuate. Past performance is not necessarily a guide to future performance and forecasts are not a reliable indicator of future results. Nothing in this report should be construed as an offer, or the solicitation of an offer, to buy or sell securities by us. As we have no knowledge of your individual situation and circumstances the investment(s) covered may not be suitable for you. You should not make any investment decision without consulting a fully qualified financial advisor. The marketability of some of the companies we cover is limited and you may have difficulty buying or selling in volume. Additionally, given the smaller capitalisation bias of our coverage, the companies we cover should be considered as high risk.

ALIGN reports may not be reproduced in whole or in part without prior permission from ALIGN Research. This financial promotion has been approved by Align Research Limited, which is authorised & regulated by the Financial Conduct Authority. FRN No. 768993. © 2021 Align Research Limited.



Align Research Limited
7 Moorhead Lane
ShIPLEY
UK
BD18 4JH

Tel: 0203 609 0910
E: info@alignresearch.co.uk