



MAGNUM ADVANCES GREEN PIG IRON OPPORTUNITY

Magnum Mining & Exploration (ASX: **MGU**, “**Magnum**” or “the **Company**”) is delighted to announce that an agreement has been reached with Midmetal of Saudi Arabia to jointly fund a Feasibility Study on producing zero-carbon “green” pig iron with Magnum on a 50/50 basis.

HIGHLIGHTS

- Agreement with Midmetal to jointly fund a Feasibility Study into the development of a HIs melt facility in Saudi Arabia on a 50/50 basis
 - HIs melt to operate on a net zero-carbon basis to produce green, high quality pig iron
 - HIs melt to be fed by Buena Vista magnetite concentrate augmented with steel mill waste
 - Feasibility Study will include the production and supply of renewable biochar
 - Magnum and Midmetal will jointly develop agreements for project funding and pig iron offtake
 - The study is being fast tracked and is expected to be completed by the end of 2023
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The Feasibility Study (FS) will assess the technical and economic benefits of producing green pig iron in Saudi Arabia using the HIs melt technology to smelt waste materials from Saudi steel mills, plus iron ore concentrate from Magnum’s Buena Vista mine in Nevada, USA. These iron materials will be smelted into high quality pig iron using biochar sourced from sustainably produced biomass. This will allow the pig iron to be certified as having “net zero” carbon dioxide emissions and attract a pricing premium.

The pig iron will be sold to local Saudi, MENA, EU, USA and Asian steel plants for the production of green steel.

Magnum entered into a Memorandum of Understanding with Middle East for Metallic Industrial (“Midmetal”) on 1 September, 2023¹. MOU negotiations have now concluded successfully, with an agreement on joint funding the FS on a 50/50 basis. The MOU is nonbinding and either party may terminate it on a no cause basis without liability.

This FS will evaluate the capital and operating costs of the pig iron and biochar facilities and the iron ore mine. The key financial indicators, Net Present Value (NPV) and Internal Rate of Return (IRR), will be standard outputs from the financial model based on these costs.

It is expected that the FS will be completed by the end of 2023.

¹ ASX:MGU “Midmetal Pursues MOU with Magnum”, 1 September, 2023.

MARKETING: AN INTEGRAL PART OF THE FS

In parallel with the FS, Magnum and Midmetal will jointly develop binding agreements for the project funding, joint ventures, supply of raw materials and offtake of the pig iron.

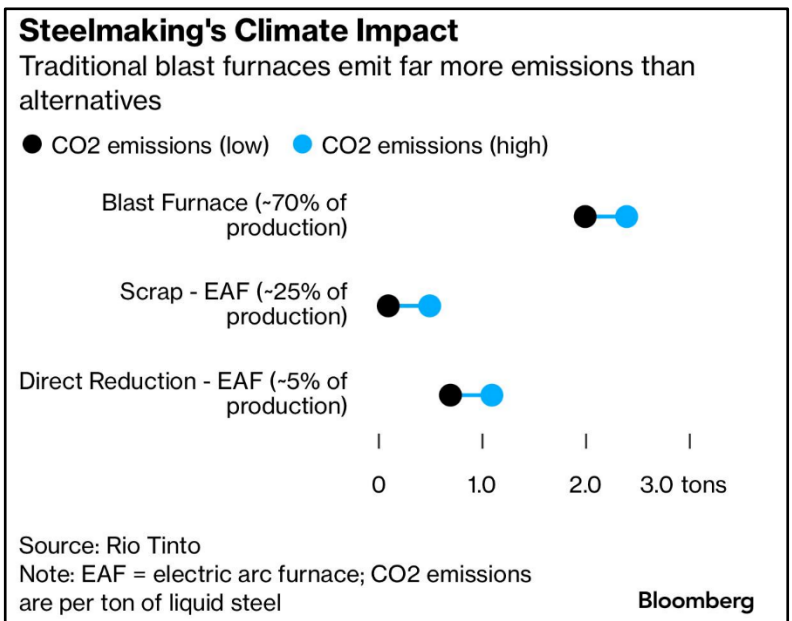
WHERE TO IRON ORE?

The future of iron ore demand and pricing is dependent on many factors. The common theme of emissions reduction, however, is emerging as a major, and possibly sole driving theme. In a recent article, Bloomberg has identified such a theme² by arguing for the need for the steel industry to decarbonise, and do it quickly. Europe is putting in place policies that will see traditional carbon-intense steel production heavily taxed.

“The transition away from coal-based steel making is a reality, but it will take some time and there remain significant uncertainties”
 (Simon Farry, Rio’s Head of Steel Decarbonisation in the Bloomberg article).

Steel decarbonisation is being pursued through three pathways:

1. Changing the reductant that turns iron oxide into iron. Coke, made from coal, has been the traditional method since the 14th century. This method produces two to three tonnes of carbon dioxide for every tonne of pig iron produced. Research is currently underway to use hydrogen as the reduction, so producing water as the waste product, but this is yet to be taken out of the lab and commercialised.
2. Use of higher grade iron feeds. Direct Reduced Iron feeds, with iron grades of over 68% Fe, produces less than one tonne of carbon dioxide per tonne of pig iron produced. The easiest source of DRI feeds is magnetite. While some high grade haematites exist, they currently make up less than 3% of the ores available, and that percentage is declining.
3. Alternative methods, such as electrolysis or microbe reduction of ores, which are in their infancy and unlikely to be commercialised for decades.



² “The World’s Iron Ore Powerhouse is Preparing to Reinvent Itself”, Bloomberg, 29 October, 2023, <https://www.bloomberg.com/news/features/2023-10-29/mining-metals-china-and-climate-rules-disrupt-world-s-top-source-of-iron-ore>

The most immediate, economic, and achievable route to lowering emissions is by using high grade feeds. Wood Mackenzie estimate that the shortfall in high grade iron ore could be as much as 200 million tons a year by 2050 because of the switch to high grade feeds. This shortfall will significantly increase the premium for high grade ores, a premium that is already at approximately 40% above the 63% Fe fines benchmark.

Magnum is well placed to take advantage of the emerging trend in two ways: The Company is targeting high grade magnetite concentrate production to feed the low carbon emissions steel making market. It is also pursuing the use of Hismelt to deliver net zero-emissions pig iron without the need to await the development of alternative, high cost, nascent technologies.

ABOUT MIDMETAL

Midmetal is a Saudi company who is exploring the utilisation of the latest technologies to produce pig iron in Saudi Arabia as part of the Nusaned Initiative. The Nusaned Initiative prioritises technologies to achieve the “Saudi Vision 2030” of increased localisation of downstream industries and reduce carbon emissions. Midmetal has met the requirements of the Nusaned Initiative and has been granted a certificate of acceptance supporting their proposal to build a pig iron production plant in Saudi Arabia. Funding for this pioneer initiative will be made by the Saudi Investment Development Fund “SIDF”.

ABOUT HISMELT

Hismelt is a technology disruptor that can deliver high purity pig iron now, without awaiting the development of technically challenging and economically burdensome hydrogen reduction techniques. It is a direct iron reduction method that can use biochar, sourced from renewable biomass, as the iron reductant. The use of renewable biomass makes the technology emissions neutral.

Hismelt’s disruptive technological advantages include:

- Direct use of iron feeds without the need for pelletising or agglomeration
- Use of most carbon sources as a reductant, being particularly suited to biochar fines. Coking is not required
- Improved environmental performance with a significant reduction of CO₂ emissions
- Lower operational cost than a traditional blast furnace
- Fully utilises the inherent energy in magnetite – an energy that’s lost through the alternative sintering and pelletising processes
- Effectively deals with deleterious elements (P, V, Ti) to produce a higher quality, lower silica pig iron than the traditional blast furnace
- Considerably lower capital requirement as sinter, pellet, and coking plants are not required
- Produces pig iron of exceptional purity with particularly low silica content attracting premium prices

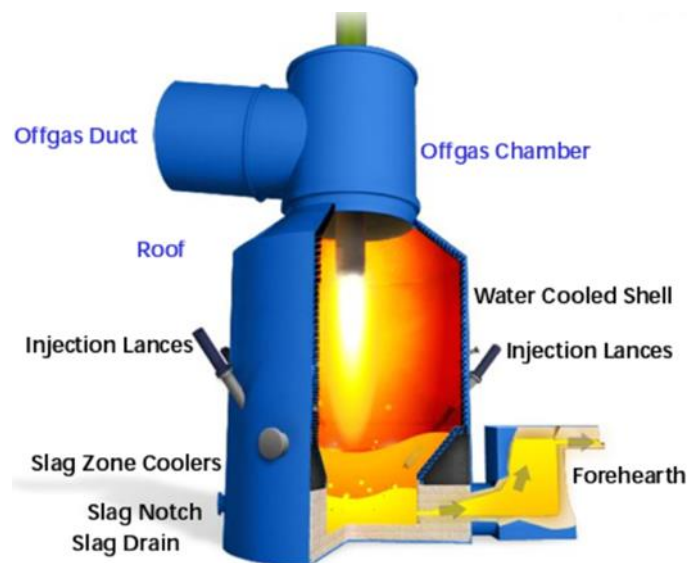


Figure 1 Hismelt: a technologically elegant solution to achieve net zero carbon emissions pig iron production now.

Magnum has entered into an agreement to licence, build, and operate a HIs melt plant³



Figure 2 Magnum and Midmetal will visit the Molong HIs melt plant in China in December, 2023. Discussions will focus on the supply of the equipment with the engineers accredited by Molong for the HIs melt technology. Six HIs melt plants are now operating in China, with more being built.

Mr Neil Goodman, CEO of Magnum commented: “This is a very exciting initiative. Midmetal’s involvement has the potential to accelerate the development of Magnum’s Buena Vista Iron Project in Nevada, USA, and catapult Magnum into green pig iron production ahead of the majors.”

³ ASX:MGU “Magnum secures pathway to HIs melt licence”, 18 May, 2023.

THE BUENA VISTA IRON DEPOSIT

Buena Vista Iron Deposit is located approximately 160km east-north-east of Reno in the mining friendly state of Nevada, United States. It was discovered in the late 1890’s and in the late 1950’s to early 1960’s around 900,000 tonnes of direct shipping magnetite ore with an estimated grade of 58% Fe was mined.

In the 1960’s, US Steel Corporation acquired the Buena Vista Project and carried out an extensive exploration program including 230 diamond drill holes and considerable metallurgical test work. Richmond Mining Limited, an ASX listed company, acquired Buena Vista in 2009 and commenced a detailed exploration program culminating in a definitive feasibility study in 2012. A key component of these studies was extensive investigation of the optimal logistics plan for the deposit’s development. This included the negotiation of in-principle agreements with existing rail and port operators and the securing of all major mining permits. Detailed costings were completed on the trucking or slurry pipeline options to deliver the concentrate to the rail head located some 50 kilometres from mine site. A significant decline in iron ore prices to less than US\$50/ tonne caused the then proposed development of Buena Vista to be deferred.

Geology

The Buena Vista Project magnetite deposits are the product of late-stage alteration of a localised intrusive local gabbro that resulted in intensely scapolitised lithologies and the deposition of magnetite. The most well-known example of this type of magnetite mineralisation is the Kiruna magnetite deposit in Sweden, which has been in production since the early 1900’s.

The distribution and nature of the magnetite mineralisation at Buena Vista is a function of ground

preparation by faulting and fracturing, forming a series of open fractures and breccia zones. These ground conditions produce variations in mineralisation types from massive pods grading +60% magnetite to lighter disseminations grading 10-20% magnetite.

Metasomatic magnetite deposits such as those at Buena Vista have important positive beneficiation characteristics over the other main type of magnetite deposit which is a banded iron hosted magnetite, also known as a taconite.

The Buena Vista ore is of magmatic origin and as a consequence is coarser grained and softer than banded iron hosted ores. Industry standard crushing, grinding and magnetic separation produces a concentrate grade of +67.5% Fe with very low levels of impurities.

Resource

The Mineral Resource Estimate to JORC(2012) standard at Buena Vista is^{4,5}

Category	Million Tonnes	Fe %	DTR %
Indicated Resource	151	19	23.2
Inferred Resource	81	18	22
Total Resource	232	18.6	22.6

The Company confirms that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

Development

Mining permits are in place to develop the Buena Vista Iron Mine. The Company has re-aligned the project from a simple mining, concentration and exporting model to a proposed green pig iron producer. Using cutting edge technology in tandem with biochar sources, the Company aims to capitalise on a first-mover advantage to supply green pig iron to the USA steel industry.

⁴ ASX:MGU – ‘Maiden JORC 2012 Resource for Buena Vista Magnetite Project’, 23 March 2021.

⁵ ASX:MGU – ‘Significant Exploration Target Defined’, 13 January 2023.

CAUTIONARY STATEMENTS**FORWARD LOOKING STATEMENTS**

This release contains “forward-looking information” that is based on the Company’s expectations, estimates and projections as of the date on which the statements were made. This forward-looking information includes, among other things, statements with respect to studies, the Company’s business strategy, plan, development, objectives, performance, outlook, growth, cash flow, projections, targets and expectations. Generally, this forward-looking information can be identified by the use of forward-looking terminology such as ‘outlook’, ‘anticipate’, ‘project’, ‘target’, ‘likely’, ‘believe’, ‘estimate’, ‘expect’, ‘intend’, ‘may’, ‘would’, ‘could’, ‘should’, ‘scheduled’, ‘will’, ‘plan’, ‘forecast’, ‘evolve’ and similar expressions. Persons reading this news release are cautioned that such statements are only predictions, and that the Company’s actual future results or performance may be materially different. Forward-looking information is subject to known and unknown risks, uncertainties and other factors that may cause the Company’s actual results, level of activity, performance or achievements to be materially different from those expressed or implied by such forward-looking information.

Forward-looking information is developed based on assumptions about such risks, uncertainties and other factors set out herein, including but not limited to general business, economic, competitive, political and social uncertainties; the actual results of current development activities; conclusions of economic evaluations; changes in project parameters as plans continue to be refined; future prices of metals; failure of plant, equipment or processes to operate as anticipated; accident, labour disputes and other risks of the mining industry; and delays in obtaining governmental approvals or financing or in the completion of development or construction activities. This list is not exhaustive of the factors that may affect our forward-looking information. These and other factors should be considered carefully, and readers should not place undue reliance on such forward-looking information.

Neither the Company, nor any other person, gives any representation, warranty, assurance or guarantee that the occurrence of the events expressed or implied in any forward-looking statement will actually occur. Except as required by law, and only to the extent so required, none of the Company, its subsidiaries or its or their directors, officers, employees, advisors or agents or any other person shall in any way be liable to any person or body for any loss, claim, demand, damages, costs or expenses of whatever nature arising in any way out of, or in connection with, the information contained in this document. The Company disclaims any intent or obligations to or revise any forward-looking statements whether as a result of new information, estimates, or options, future events or results or otherwise, unless required to do so by law.

COMPETENT PERSONS STATEMENT – RESOURCE ESTIMATION

The information in this report that relates to Mineral Resources is based on information compiled by Mr Jonathon Abbott, a Competent Person who is a Member of the Australian Institute of Geoscientists and a full time employee of MPR Geological Consultants Pty Ltd. Mr Abbott has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the “Australasian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves”. Mr Abbott consents to the inclusion of the matters outlined in Appendix A in the form and context in which it appears.

The company confirms that the form and context in which the Competent Person’s findings are presented have not been materially modified.

COMPETENT PERSONS STATEMENT – EXPLORATION TARGET ESTIMATION

The information in this report that relates to an Exploration Target is based on information compiled by Mr Marcus Flis, a Competent Person who is a Fellow of the Australasian Institute of Mining and Metallurgy and a full time employee of Rountree Pty Ltd. Mr Flis has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 edition of the “Australasian Code for Reporting Exploration Results, Mineral Resources and Ore Reserves”. Mr Flis consents to the inclusion of the matters outlined in Appendix A in the form and context in which it appears.

BY ORDER OF THE BOARD**Luke Martino**

Company Secretary

Email: info@mmel.com.au

Phone: +61 403 635 555

Evan Smith

Investor Relations

Email: evan.smith@advisir.com.au

Phone: +61 431 176 607