



MAGNUM
MINING & EXPLORATION LIMITED

**NEVADA
IRON**
The Green Steel Company

Nevada Iron is a fully owned subsidiary of MGU.

A 21st Century ESG Project on ASX

Green Pig Iron
Made In USA



MGU

The Green Pig Iron Company

IRON ORE



100% BIOCHAR PIG IRON

AUGUST 2022

ASX:MGU 2022



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The **Green** Pig Iron Company

**NEVADA
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The **Green** Steel Company



ASX Ticker	MGU
Shares on Issue	532M
*Options (Listed and unlisted)	250M
Share Price	\$0.04
MARKET CAP	\$21.4M
Cash Balance as at June 30 2022	\$2.1M



MGU

The **Green** Pig Iron Company

EXECUTIVE TEAM



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Neil Goodman
Magnum CEO + Director,
Nevada Iron

40 years' experience in the design, construction and operation of iron making plants worldwide, including 10 years in the US. Designed and operated the first commercial scale HIs melt plants in Australia (for the Rio Tinto/Nucor JV) and China (for Molong, the present owners of the HIs melt IP).



Anoosh Manzoori
Chairman

Mr Manzoori has extensive investment and investment banking expertise across many industry verticals including the mining sector. His experience also includes equity capital markets, public and private M&A in Australia, and North America. He also has extensive fund management experience in Australia and Canada.



Athan Lekkas
Non Executive Director

Mr Lekkas has several years of investment banking experience, and has been instrumental in attracting talent and funding for companies. He has advised on numerous cross border transactions including capital raisings, funding and structuring of acquisitions, joint ventures overseas and participated in a broad range of business and corporate advisory transactions.



Matthew Latimore
Non Executive Director

Matt Latimore is the Founder and President of M Resources Pty Ltd, a company he established in 2011 for marketing, investment and trading of steelmaking raw materials, with a focus on metallurgical coal.



Justin Klintberg
Adviser

Mr Klintberg has over 20 years' of investment and capital markets industry experience. Mr Klintberg was the founder and CIO of Kima Capital, a pan-Asia hedge fund headquartered in Hong Kong from 2009 to 2016. Prior to establishing Kima Capital, Mr Klintberg was a portfolio manager at a leading European-based investment manager, Marble Bar Asset Management.



Tom Gunnersen
Adviser

Tom has 20 years of Corporate, Investment and Capital Markets experience in Australia and Asia providing deep and valuable networks developed through regional investment roles. Co-Founder and Director of boutique Corporate Advisory firm KG Capital Partners, specialising in Capital Markets advisory for emerging high growth companies.



Bert Wallace
Chief Financial Officer
Nevada Iron LLC

Mr. Wallace he has an MBA in Finance/ Operations and a BS in International Business. He has over 20 years' experience in contract management, corporate compliance, and internal controls. He has provided accounting and financial consulting services on multiple contracts, for both US-based and international companies. Mr Wallace has established a working relationship with the office of Mark Amodei, the US Congressman who's district includes the Buena Vista Mine Site.



Cindi Byrns
Director, Permitting Manager
Nevada Iron LLC

Ms. Byrns has more than 35 years experience in environmental compliance and permitting experience in mining, including 8 years experience with Nevada Iron's Buena Vista Mine. Ms. Byrns is responsible for environmental, land, water and regulatory and government relations.

BUENA VISTA RESOURCE HIGHLIGHTS



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<p>Zero Carbon pig iron plant in the USA</p>	<ul style="list-style-type: none"> Magnum is working towards becoming the first green pig iron plant in the USA, with "Net Zero" carbon emissions
<p>Low cost iron ore concentrate</p>	<ul style="list-style-type: none"> JORC compliant, indicated and inferred resource of 232M t @ 18.6% Fe¹
<p>Significant "green credentials"</p>	<ul style="list-style-type: none"> Anticipate the Plant will produce 2M tpa less CO₂ than a comparable BF plant due to the replacement of replacement of coal by locally sourced biochar The unique flexibility of the HIs melt process allows the plant to use hydrogen in future Remediation and clean up of legacy steel wastes, which cannot be recycled/removed profitably by any other operation Generates excess renewable power from the biochar plants and HIs melt plant

The Company confirms that it is not aware of any new information or data that materially affects the information included in the Maiden JORC 2012 Resource for the Buena Vista Magnetite Project announced on 23 March 2021 and that all material assumptions and technical parameters underpinning the estimates in the announcement of the 'Maiden JORC 2012 Resource for the Buena Vista Magnetite Project' dated 23 March 2021 continue to apply and have not materially changed.

* Comprising an Indicated Resource of 151Mt @ 19.0% Fe and an Inferred Resources of 81Mt @ 18.0% Fe (ASX:MGU 23 March, 2021)

INVESTMENT HIGHLIGHTS



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Growth in market and production

- 10-year average price of pig iron is \$400/t CIF NOLA, expected to increase as pig demand increases due to increased use by electric steelmakers to produce higher grade steels and shortages of high-grade steel scrap
- Nevada location may reduce freight costs to western steel mills and may command an additional premium compared to NOLA
- HIs melt pig iron product has higher value-in-use than BF pig iron and may command a premium due to lower levels of impurities and higher iron content
- Project will provide a template to exploit similar opportunities on a global scale

Strong support from strategic partners

- Agreements under negotiation for pig iron offtakes and waste materials supply with major USA steelmakers
- Agreements under negotiation for sourcing of biomass, water and power with local authorities
- Multiple other supportive stakeholders

Significant social credentials

- Opportunity for the Plant to create 1,000 construction and 1,000 permanent jobs in Nevada for the mine, beneficiation plant, HIs melt plant and biochar plants

INVESTMENT OPPORTUNITY BIO-PCI AND GREEN PIG



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Decarbonise steel production via the use of low carbon footprint "Bio-PCI" and "Green Pig Iron"

- **Bio-PCI:** biochar powder produced via the pyrolysis of sustainably sourced biomass with internationally certified carbon credits. Analysis as per PCI coal: 80% fixed carbon, 5-10% ash, 10-15% volatiles, high energy content
- **Bio-PCI produced from agricultural and forestry waste biomass from Nevada and/or California**
- **Green Pig Iron:** pig iron produced via the direct smelting of iron ore concentrate with Bio-PCI using the Hismelt technology
- **Green Pig Iron produced from low-cost iron ore concentrate from Nevada**

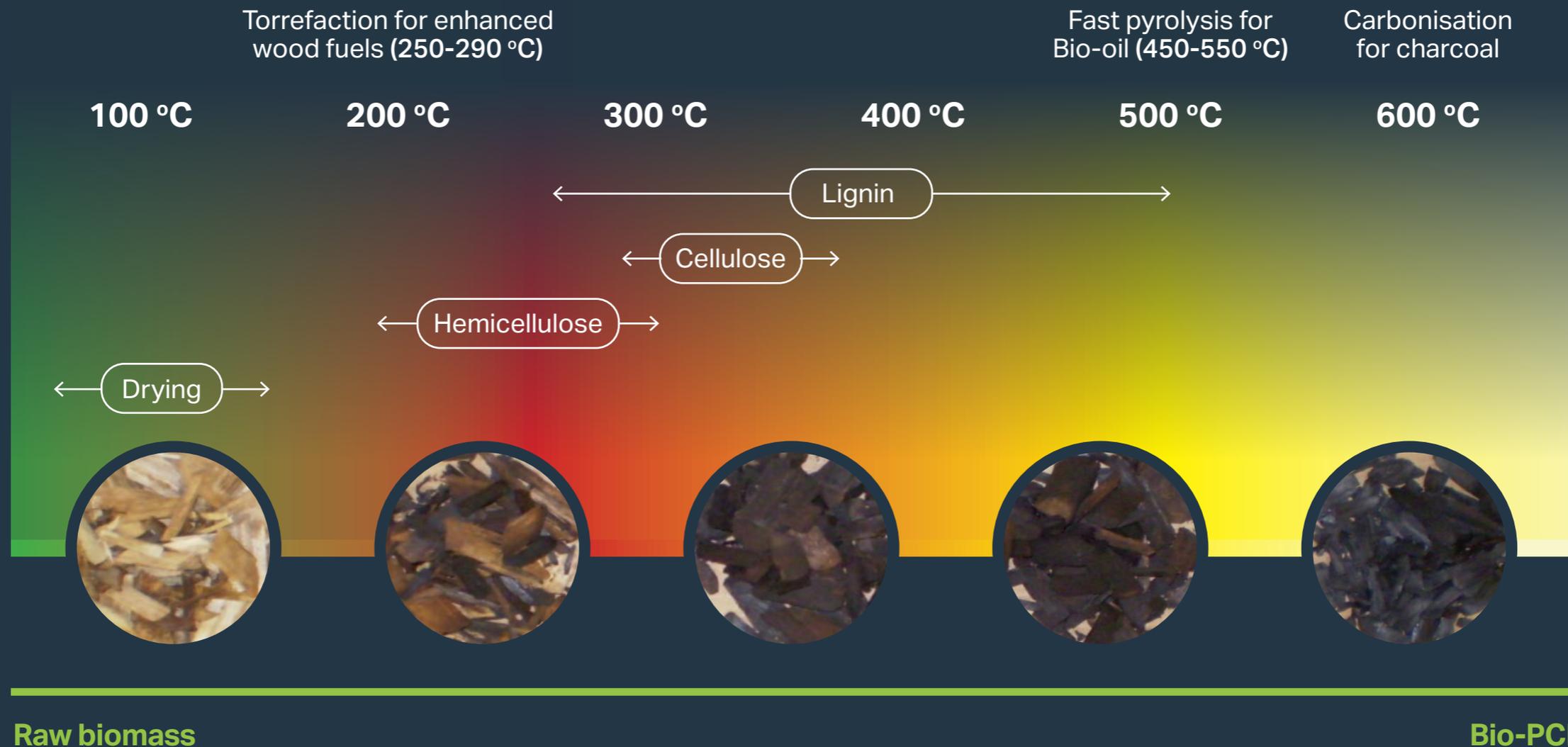
BIO-PCI PROCESS



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Produced via the torrefaction and pyrolysis of biomass in the absence of oxygen



PERMANENTE GRC88™ BIO-PCI ADVANTAGES



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- Scalable, modular, and mobile reactors continuously torrefy and pyrolyze biomass in an oxygen free environment between 300° C and 450° C at material flow rates between 30 TPH and 50 TPH.
- Ample low-cost sustainable feedstocks support Hismelt biocarbon needs for multi-million TPY green pig iron production.
- GRC88™ reactor produced biochar is 70% to 80% fixed carbon which is comparable to PCI type coals. Additionally, it is free of sulfur and heavy metals, and is carbon neutral.
- Reliable and efficient GRC88™ reactors have few moving parts and operate at low cost by repurposing process heat.

PERMANENTE

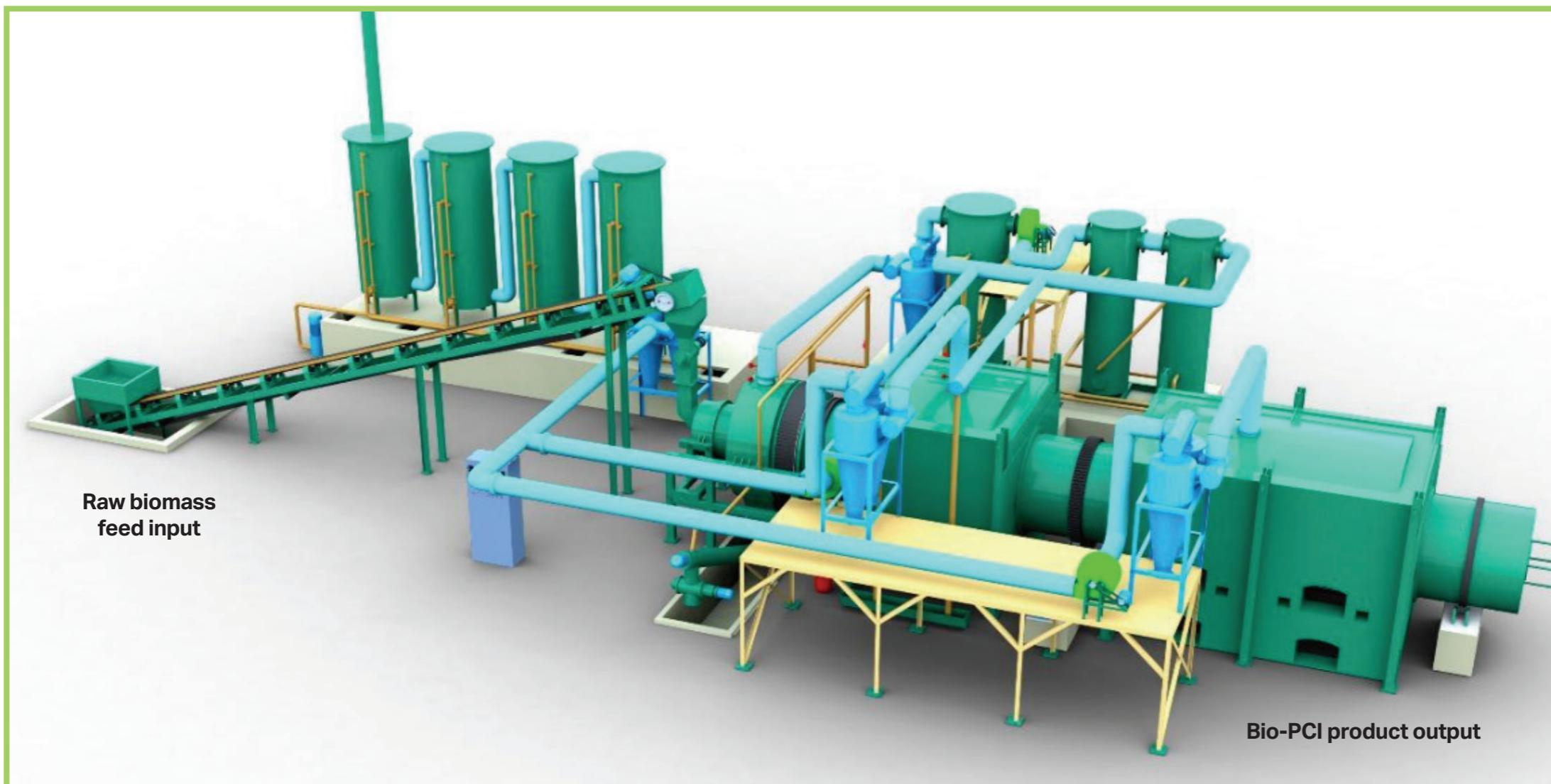
i. US 11,345,860B2, US 10,961,459B2, and US 9,758,738 B2

BIO-PCI TECHNOLOGY



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USE OF BIO-PCI



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Direct replacement of PCI coals for injection into blast furnaces

- ✓ Modern blast furnaces inject approximately 200kg of PCI per tonne of iron plus 300 kg/t of coke.
- ✓ Therefore 40% of carbon emissions of a blast furnace can be removed via the use of Bio-PCI
- ✓ Important transition to reduce carbon emissions for steel production until blast furnaces are replaced

Direct replacement of PCI coals for injection into Hismelt furnaces

- ✓ Hismelt furnaces use approximately 800kg of PCI per tonne of iron with zero coke.
- ✓ Therefore 100% of carbon emissions of a Hismelt plant can be removed via the use of Bio-PCI

Solutions for "Green" high-quality steel production

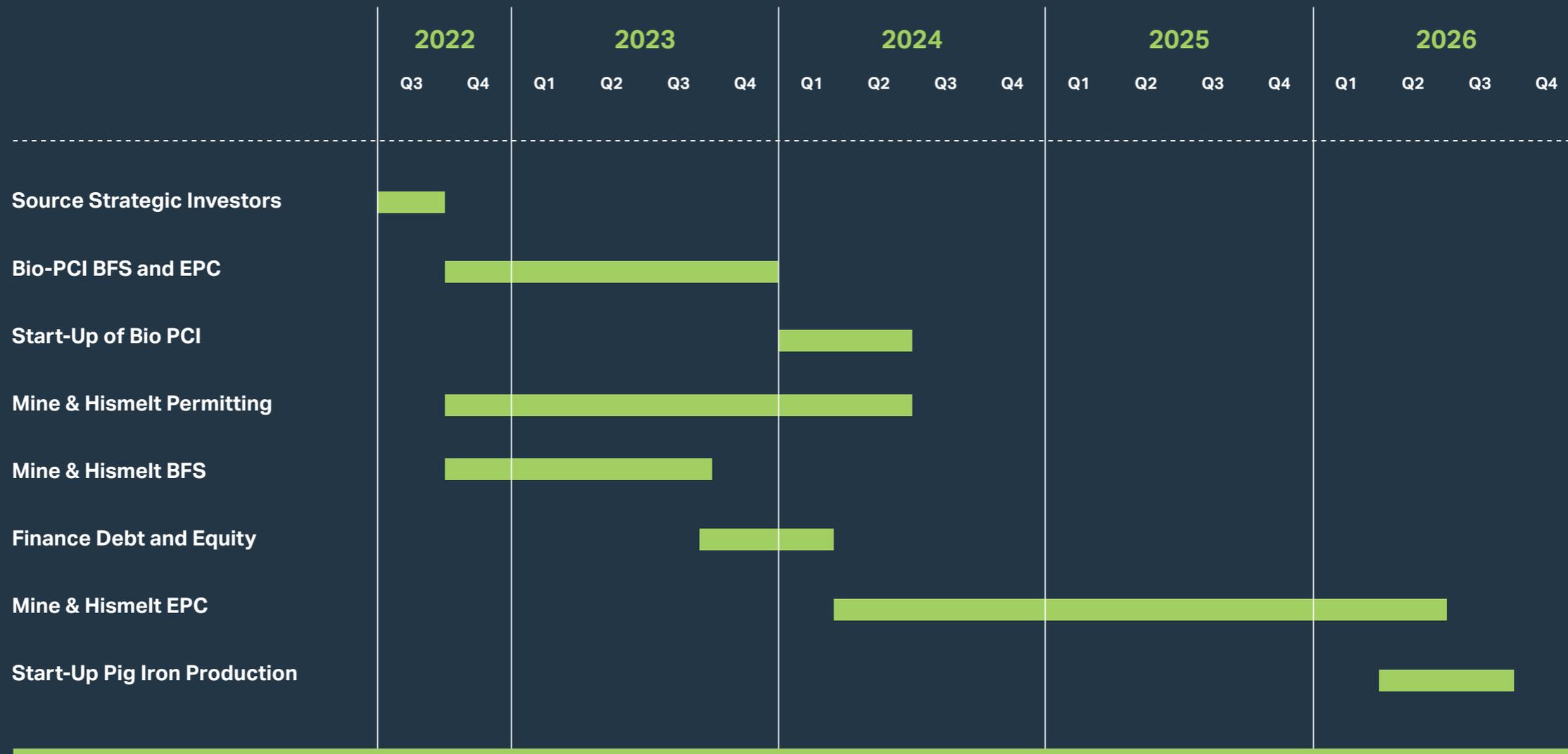
- 1 70% scrap plus 30% Green Pig Iron melted in an electric arc furnace. 1m tonnes per year of green pig iron can support the production of 3m tonnes per year of high-quality green steel via an electric arc furnace
- 2 100% Green Pig Iron with 10% scrap melted in a basic oxygen furnace. 1m tonnes per year of green Hismelt pig iron can produce 1m tonnes per year of high-quality green steel via a basic oxygen furnace.

BIO-PCI AND PIG IRON PROJECT SCHEDULE



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SCHEDULE FOR FIRST BIO-PCI PLANT*



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Date	Activity	Details
Stage 1	Bankable Feasibility Study for Bio-PCI production	Develop +/- 10% lump sum quality estimate to obtain equity and debt financing
Stage 2	Engineering and procurement (EP) of Bio-PCI production module	Design and purchase of equipment of a single Bio-PCI production module. Environmental permitting and certification of carbon credits
Stage 3	Construction of Bio-PCI module	Construction and commissioning of Bio-PCI module
Stage 4	Start-up and ramp-up of first Bio-PCI module	Start and ramp up Bio-PCI production, first sales to users, generation of carbon credits

SCHEDULE FOR FULL BIO-PCI MINE AND HISMELT*



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Date	Activity	Details
Stage 1	Bankable Feasibility Study for mine and Hismelt	Develop +/- 10% lump sum quality estimate to obtain equity and debt financing. Kick off environmental permitting
Stage 2	Close financing of equity and debt for additional Bio-PCI, mine and pig iron plants	Raise \$400m equity, \$600m debt financing for additional Bio-PCI modules, iron ore mine, beneficiation plant and Hismelt plant. Continue environmental permitting
Stage 3	EP of Bio-PCI, mine and Hismelt plants (after first Bio-PCI plant start-up)	Design, purchase and fabricate equipment, finalise environmental permitting
Stage 4	Construction of Bio-PCI, mine and Hismelt plants	Construction and commissioning of Bio-PCI, mine and Hismelt plants
Stage 5	Commission and start up Bio-PCI, mine and Hismelt plants	Commission Bio-PCI, mine and Hismelt plants Produce and sell green pig iron

FUNDAMENTAL TRENDS ARE CHANGING THE METALLICS LANDSCAPE



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High quality metallics USA supply/demand is changing drastically, even before the Ukraine war.

- Fundamental shifts in end market trends are changing the demand mix toward higher-quality steel
- EAF capacity build-out displacing BOF capacity, largely in the MidWest, will impact supply of high-quality scrap.
- Declining availability of high-quality scrap (e.g. Home and Prompt sources, particularly at today's price point) further tightens High Quality Metallics ("HQM") supply
- More widely available obsolete scrap carries high residual levels, particularly electrical copper which are deleterious for high quality particularly flat product ranges
- Rapid build-out of DRI production capacity, though captive, is adding a modest amount of new HQM supply to the USA market

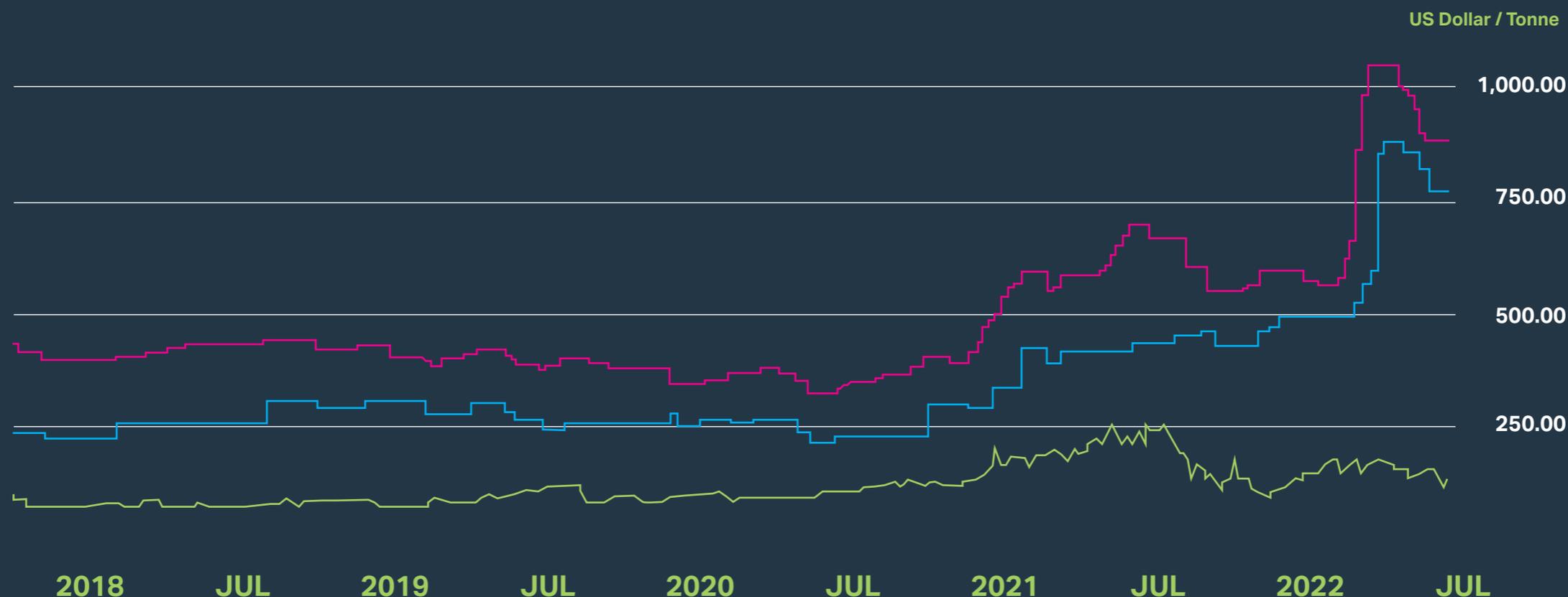
PIG IRON IS THE HIGHEST VALUE RAW MATERIAL IN STEELMAKING



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Mid **MB -IRO-0078**
Pig Iron Basic Grade, Brazil,
Fob New Orleans, \$/Tonne

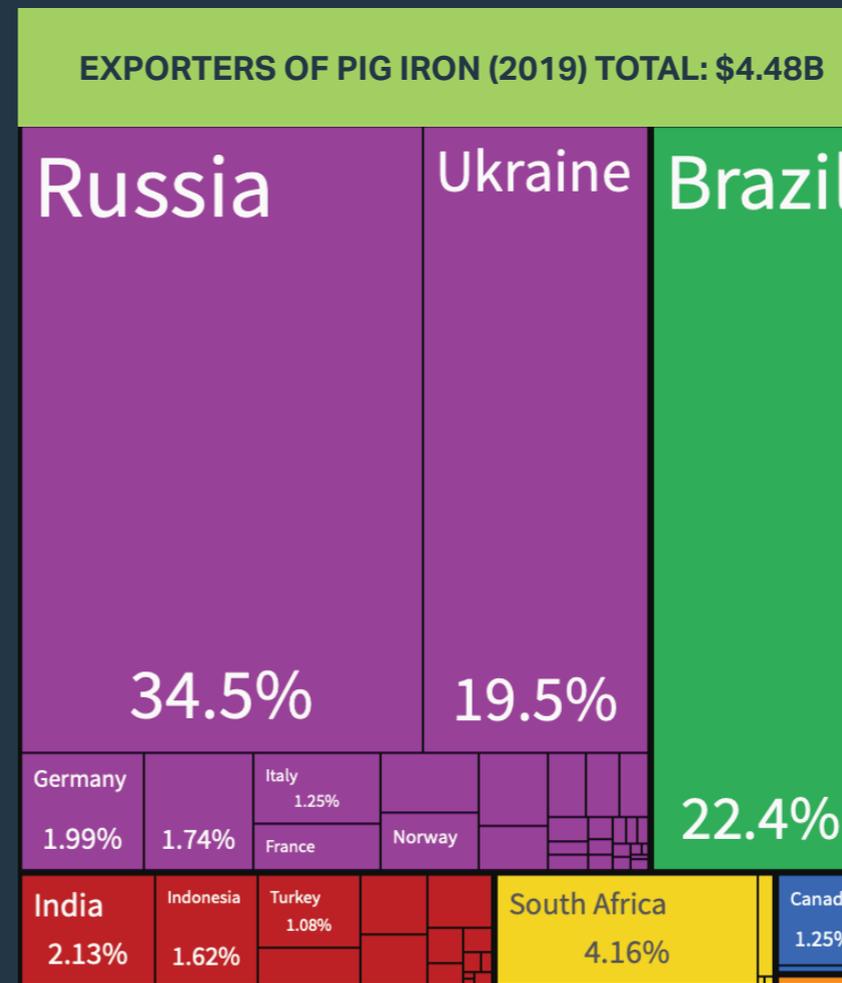
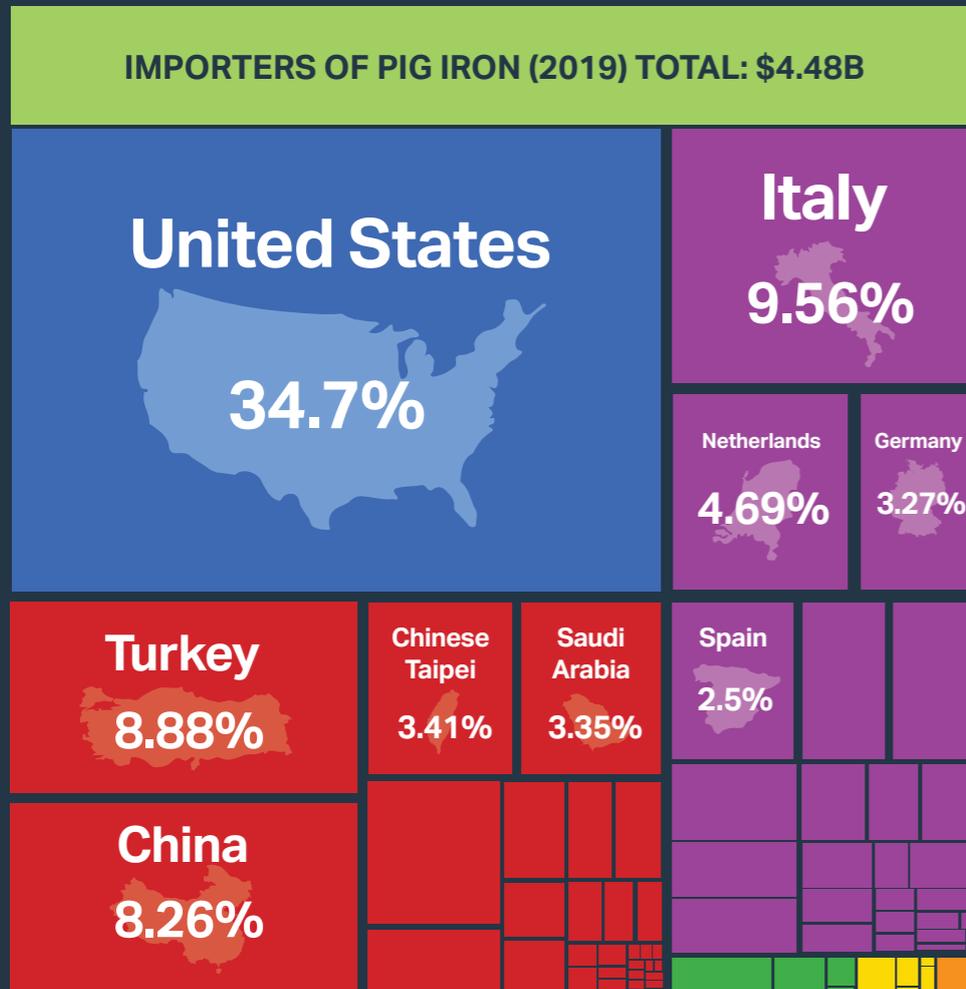


Mid **MB -FE-0009**
Hot-Briquetted Iron,
Fob NEW Orleans, \$/Tonne



Mid **MB-IRO-0009**
Iron Ore 65%
Fe Brazil-Origin Fines,
CFR Qingdao, \$/Tonne

FACTS



- ✓ USA is the largest pig iron importer
- ✓ Ukraine and Russia supplied 65% of world demand, now zero supply
- ✓ Pig iron prices increased to > \$1000/t from \$400/t

- ✓ EU considering export ban
- ✓ China encouraging import to expand EAF production
- ✓ Brazil exported more to China than USA in 2021
- ✓ USA infrastructure bill

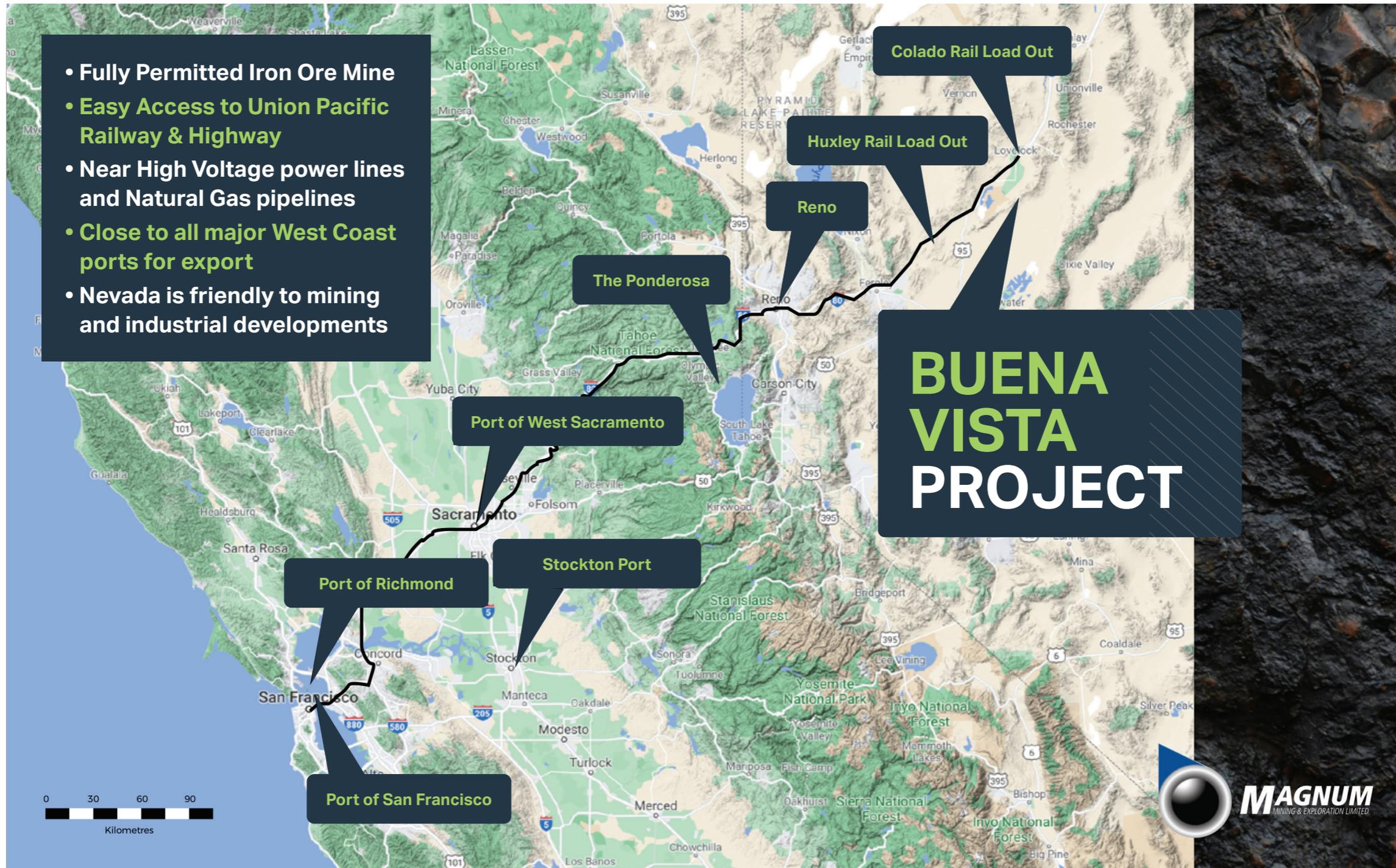
INFRASTRUCTURE IN PLACE



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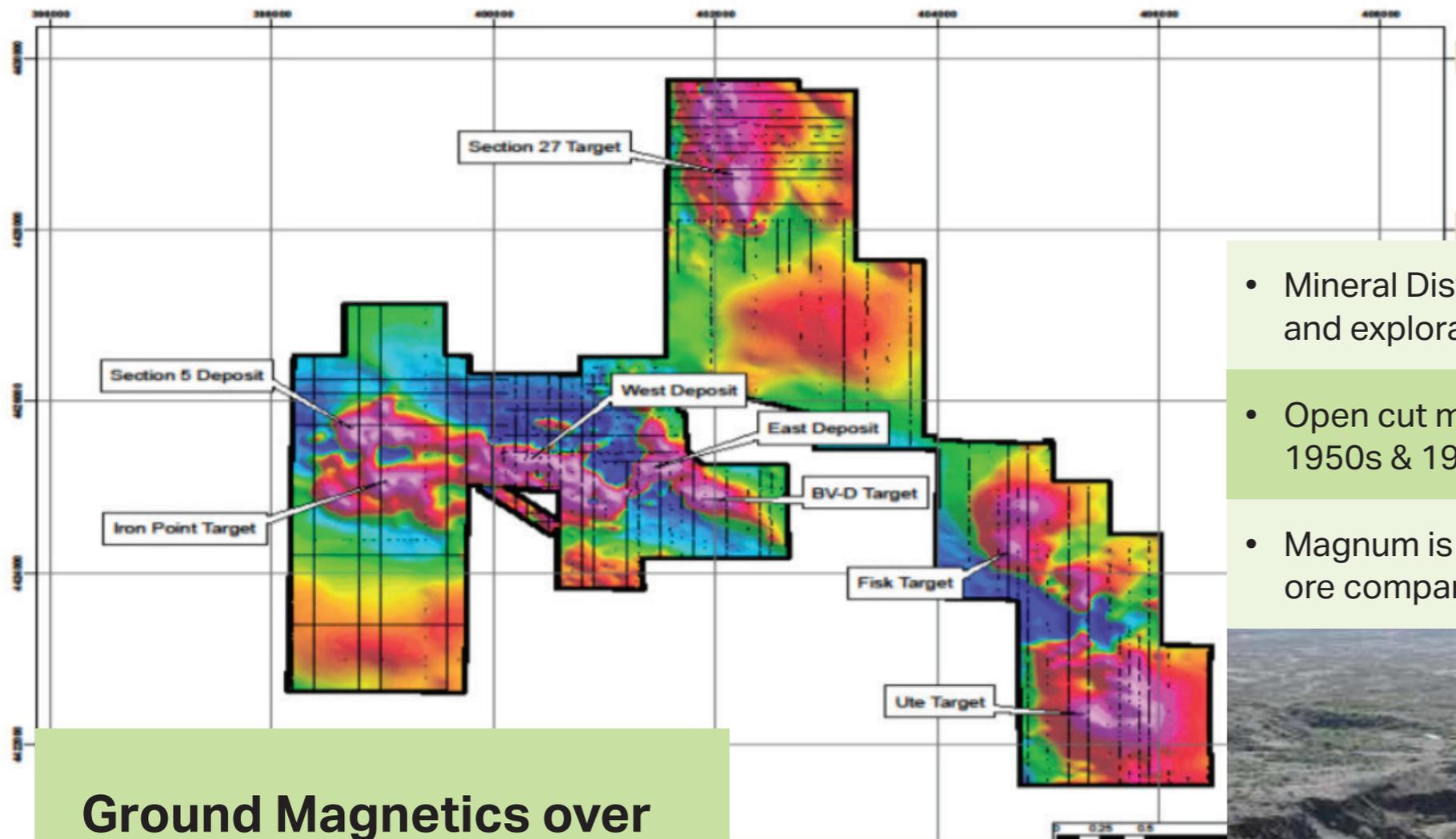


RESOURCES EXPANSION OPPORTUNITY



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**Ground Magnetics over
Buena Vista Project Area**

- Mineral District has a 60 year mining and exploration history.
- Open cut mining operations in the 1950s & 1980s.
- Magnum is the only fully permitted iron ore company in the district.





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EXCLUSIVE PIG IRON PRODUCER ON THE WEST COAST USA

Magnum will be the only pig iron producer on the West Coast USA



- All Pig Iron Producers on East Coast
- USA EAF Steel 2021 80%
- USA EAF Steel 2025 85%

Pig Iron Producer

Pig Iron Buyer

UNIQUELY PLACED TO SUPPLY USA WEST COAST CUSTOMERS

Regional USA Domestic Customers & Steel Capacity

- All West Coast steelmakers are moving up the value chain for premium steel products. More pig iron is needed.
- All West Coast steel mills are EAF operations, currently totaling over 7 million tonnes of steel (requiring approx. 1.5 million tonnes of pig iron).
- No stable pig iron supply for all the West Coast steel mills.
- All regional steel mills are expanding capacity due to record market demand.



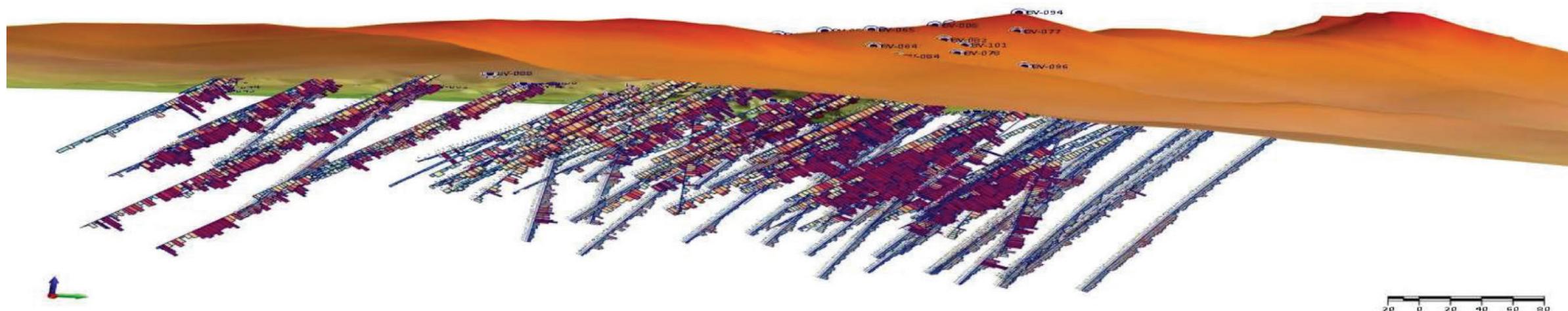
MAGNUM'S HIGH-GRADE RESOURCE



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- Total reported Mineral Resources 232Mt (JORC 2012 compliant).*
- Metasomatic deposit formed through deposition of magnetite into an intensely altered gabbro host.
- Magnetite is present as high grade pods, disseminations and veins.
- Mineral resource estimate based on 23,061 metres of diamond and 13,024 metres of RC drilling and three generations of extensive metallurgical testing.
- Resources modelling very well understood.
- Very favourable mining and beneficiation characteristics because of metasomatic genesis.
- Significant capex and opex benefits compared to typical BIF hosted magnetite deposits.

*232 million tonnes at 18.6% Fe. See ASX announcement dated 23 March 2021 for further details regarding the Mineral Resource.

Cut off Fe %	Deposit	Indicated			Inferred			Total		
		Mt	Fe %	DTR %	Mt	Fe %	DTR %	Mt	Fe %	DTR %
10.0	Sect 5	34	17.4	21.0	8.0	16	18	42	17.1	20.5
	West	117	19.5	23.9	40	17	21	157	18.9	23.2
	East				33	19	23	33	19.0	23.0
	Total	151	19.0	23.2	81	18	22	232	18.6	22.7
15.0	Sect 5	21	20.2	25.1	3.8	19	24	25	20.0	24.9
	West	90	21.4	26.7	26	20	24	116	21.1	26.1
	East				25	21	26	25	21.0	26.0
	Total	111	21.2	26.4	55	20	25	166	20.9	25.9
20.0	Sect 5	9.1	24.1	30.9	1.3	23	29	10	24.0	30.7
	West	40	26.5	34.4	9.6	25	32	50	26.2	33.9
	East				13	24	31	13	24.0	31.0
	Total	49	26.1	33.8	24	24	31	73	25.5	33.0
25.0	Sect 5	2.8	28.6	37.7	0.3	27	36	3.1	28.4	37.5
	West	19	31.5	41.9	3.5	30	39	23	31.3	41.4
	East				3.6	29	38	3.6	29.0	38.0
	Total	22	31.1	41.4	7.4	29	38	29	30.7	40.6

* DTR% is the estimated proportion of the rock mass recoverable by simple magnetic concentration on the basis of the Davis Tube Recovery analyses for drill hole samples. It is strongly correlated to iron grades.

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HIGH-QUALITY CONCENTRATE & SIMPLE BENEFICATION PLANT

Buena Vista Concentrate Specification

Test Items	Unit	Result	Standard No.
		/	
TFe	%	63.00	GB/T 6730.5-2007
FeO	%	21.82	GB/T 6730.5-8-2016
Si	%	3.02	GB/T 6730.62-2005
Al	%	0.69	GB/T 6730.62-2005
P	%	0.016	GB/T 6730.62-2005
S	%	0.0680	GB/T 6730.17-2014
Volume average particle size	µm	43.21	GB/T 19077-2016

- ✓ Magnetic processing to produce +63% Fe concentrate.
- ✓ Coarse grained magnetite ore with easy grinding ~ 100 mesh
- ✓ Low cost processing plant.



Lab Reference No.:MNT215097QD
SGS Report No.: MSRQD2100795-01A
Testing Report Page: 2/2

TECHNOLOGY ASSESSMENT REPORT – HISMELT THE OPTIMUM TECHNOLOGY



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Magnum Mining and Exploration Ltd procured an independent technology report in support of the production of green pig iron from their Buena Vista iron ore deposit in Nevada, USA.

- The study was performed by MinRizon Projects, and comprised techno-economic analyses of the following three technologies capable of producing green pig iron using biochar:

- **Mini- blast furnaces**

- **Rotary hearth and submerged arc furnace**

- **Hismelt**

-
- **The results of the study indicate that the Hismelt technology offers the greatest economic benefits to MGU as opposed to the Mini Blast Furnace and the Rotary hearth and submerged arc furnace, with the highest NPV and IRR. Following the results of the study, Magnum continues to progress the project via discussions with regional biochar producers and**

with potential strategic partners (including in respect of obtaining a licence to use the Hismelt technology) and Hismelt processing options are intended to be pursued in future studies of the Buena Vista project.

- **The Hismelt technology IP was developed over many years by Rio Tinto and comprises approximately 100 patent families registered around the world. Several of the patents were authored by Neil Goodman, the present CEO of Magnum, while he was General Manager of Rio Tinto's Hismelt Corporation. The Hismelt IP portfolio was purchased by Molong Petroleum Machinery Ltd, a private Chinese steel company, and Molong licence the right to use the IP to users of the technology. Magnum is progressing discussions with Molong in respect of seeking to obtain a licence for the Company to use the Hismelt technology.**

HISMELT TECHNOLOGY

KEY PRINCIPLES



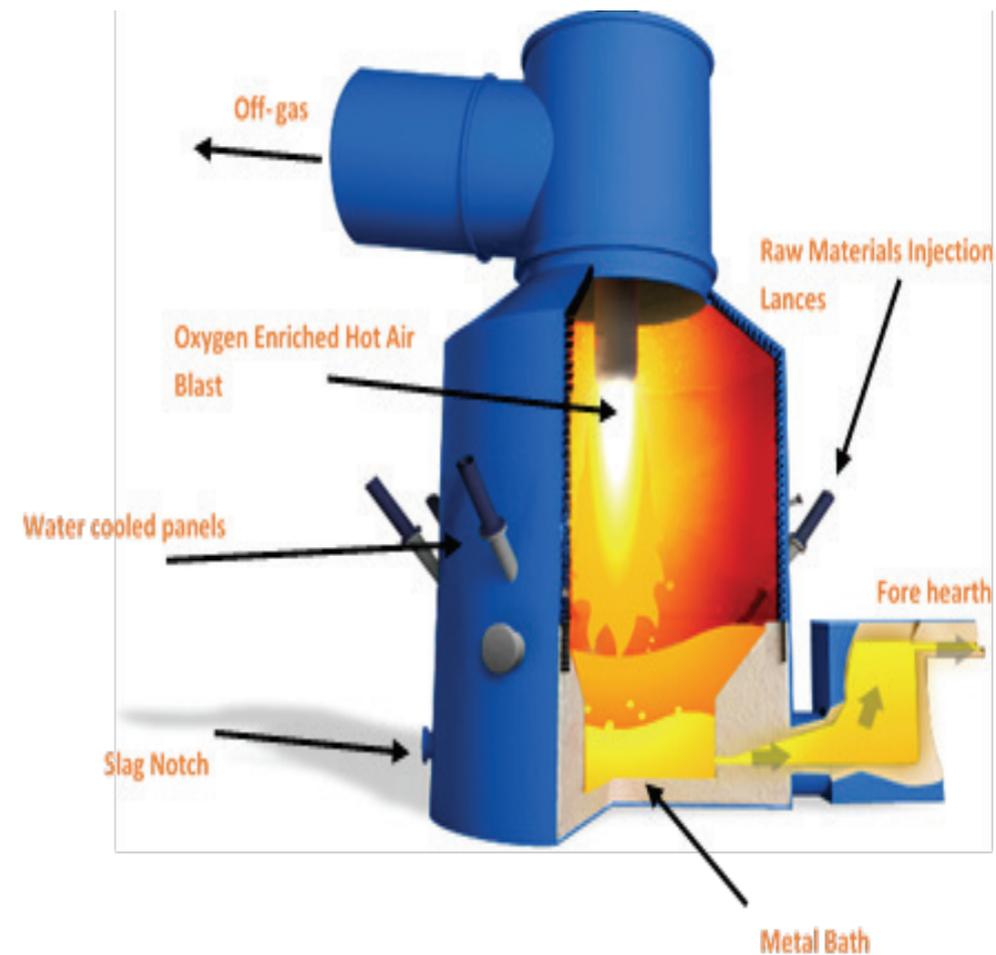
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The “future of ironmaking” is here

- The Hismelt process represents a practical alternative to the blast furnace to produce pig iron
- Hismelt is a direct smelting reduction iron-making process that directly smelts preheated ferrous materials (e.g. iron ore fines, millscale, slags, etc) and reductants (e.g. non-coking coal, biochar, etc) as the system’s source of reducing agents and heat
- The ferrous fines, reductants and fluxes are injected into the molten iron bath
- A fountain of molten metal erupts into the top space by rapid expulsion of CO, H₂, N₂ from molten bath
- Reaction gases CO and H₂ are combusted with oxygen from hot blast, generating heat
- Heat from the gas combustion top space and heated metal and slag which fall back into the bath, provide energy for sustaining reduction reactions and direct smelting of iron ore
- Slag coats and protects water cooled panels, minimizing energy loss



**Smelt Reduction Vessel (SRV) at
the Heart of Technology**

HISMELT TECHNOLOGY PATH TO COMMERCIALISATION

1980's	Small Scale Pilot Plant (SSSP) in Germany – 10kt/yr design
1990's	Hismelt Research & Development Facility (HRDF) pilot plant in Kwinana, Australia, – 100kt/yr design
2000's	Hismelt Kwinana Joint Venture (HKJV) demonstration plant in Kwinana, Australia owned by a consortium of Rio Tinto, Nucor, Mitsubishi and Shougang – 800kt/yr design
2016	Start-up of the first commercial Hismelt plant in China at Molong – 800kt/yr design
2022	2 Hismelt plants in operation, 8 under construction, all in Asia. More than 3m tonnes of pig iron produced to date



Kwinana Hismelt Plant



Molong Hismelt Plant

HISMELT TECHNOLOGY ADVANTAGES



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Green, flexible, high purity and low cost

Environmental benefits

- Reduced CO₂ emissions as well as pm₁₀, SO_x, NO_x, durans/furans and benzene compared to traditional blast furnace operations using sinter plants and coke ovens.
- Clear and defined path to zero carbon emissions. Hismelt was chosen as the preferred smelter technology for the EU's ULCOS (Ultra Low CO₂ Steelmaking) program that aims to reduce CO₂ emissions of the steel industry by 90%

Greater raw material flexibility

- Ability to use lower grade raw materials which are not suitable for blast furnace or DRI shaft furnace operation, including high phosphorous, high alumina, and high titanium iron ores, C-fines (ultra-fine slag fines), mill-scale, steel works slags, dusts, sludges, non-coking coals and biomass.
- In addition, the raw materials are injected as powders and do not require agglomerating into pellets or briquettes.

HISMELT CAN CONVERT GREEN DRI TO PIG IRON

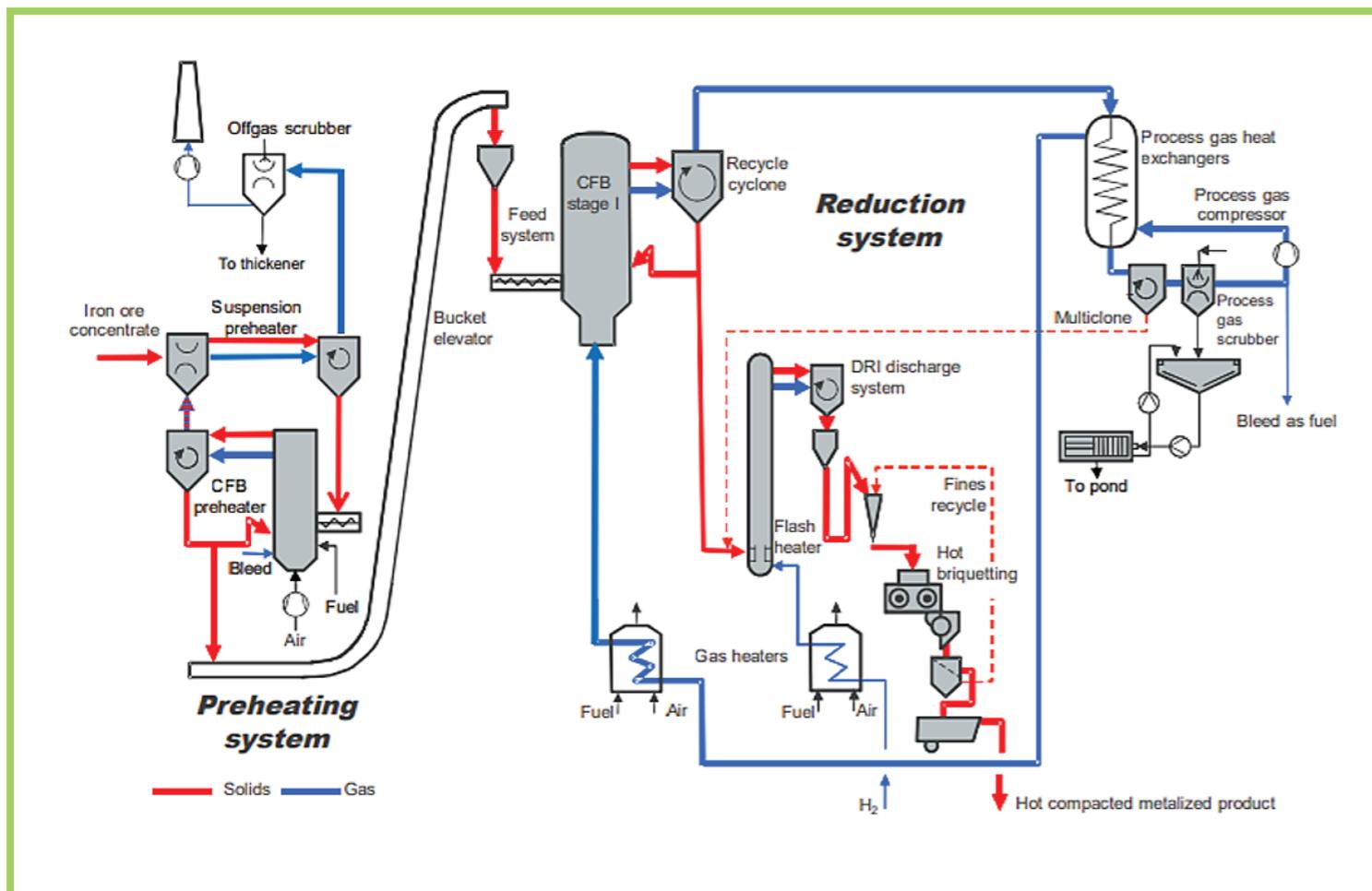


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Single stage Circored process



- ✓ Future cost of hydrogen expected to be \$1 - \$2/kg
- ✓ Iron ore fines can be reduced economically by hydrogen at 600C
- ✓ CircoRed (Outotec) proven 20 years ago producing 500,000 tpy of hot DRI
- ✓ Hot DRI fines can be injected directly into a Hismelt vessel to increase productivity and decrease biochar consumption by 50-75%

HISMELT TECHNOLOGY ADVANTAGES



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Green, flexible, high purity and low cost

Lower operating costs

- Due to the elimination of front-end processes required for a BF operation (i.e. no coke ovens or sinter plants) and DRI shaft furnaces (no pellet plant) as well as ability to use a wide variety of cheap raw materials (see above).

Significantly lower capital costs

- Due to the elimination of coke ovens, sinter and/or pellet plants. The construction of a Hismelt plant is relatively simple as the Hismelt technology uses many of the traditional ironmaking core plant ancillary facilities, such as hot blast stoves, injection systems and power plants.
- The capital costs of constructing a Hismelt plant could be up to 60% less than constructing a similar sized BF or DRI plant (including coke ovens, pellet plants etc.).

Higher quality final product (high purity pig iron)

- When compared to the traditional BF and DRI processes, including significantly lower silicon, manganese and phosphorous content. The lower levels of impurities provide yield and fluxing benefits in the downstream steelmaking process for BOF and EAF producers. Hismelt pig iron will demand higher value-in-use premiums than DRI and BF pig iron

CHARRING OF SUSTAINABLY HARVESTED BIOMASS

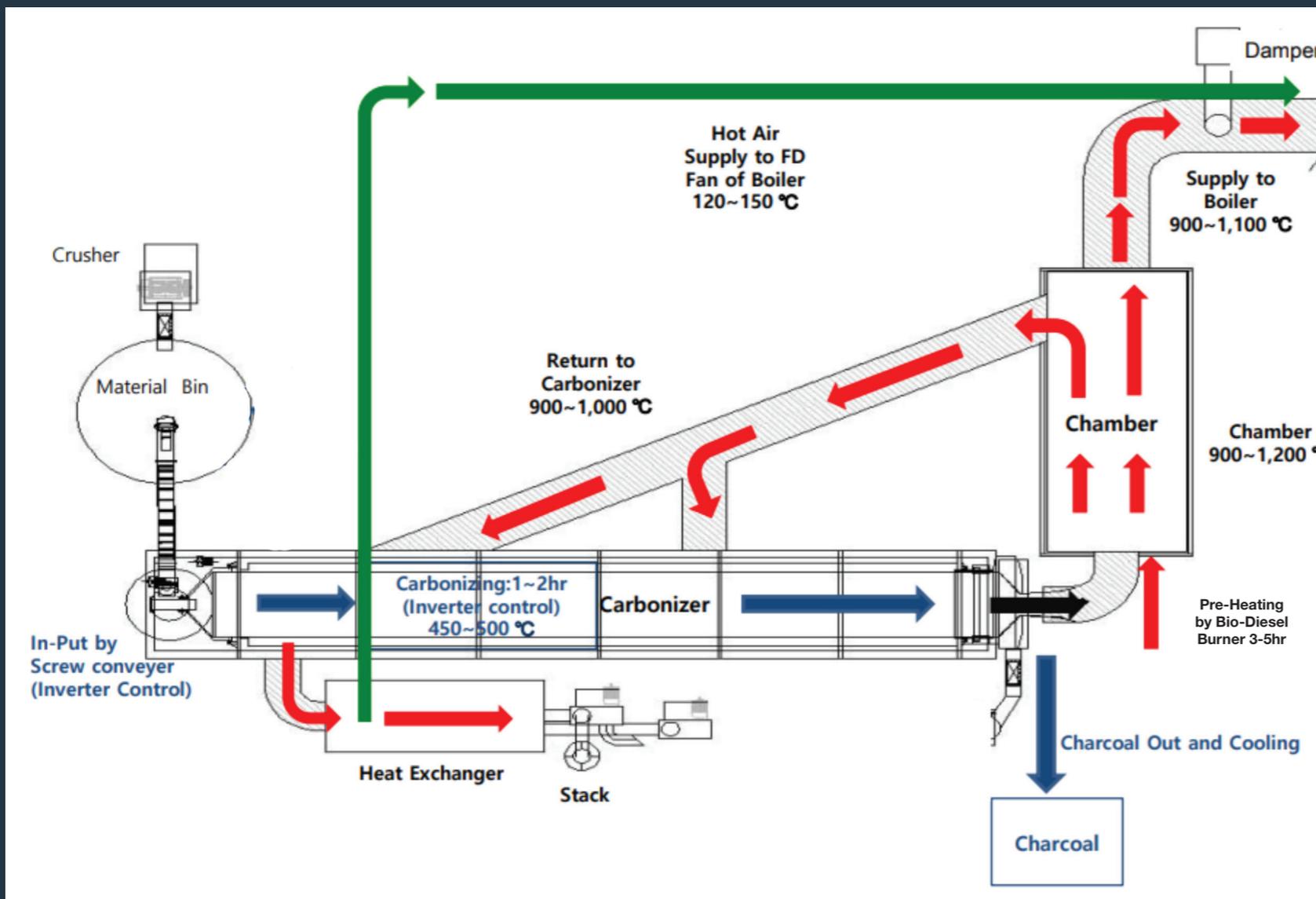


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Generates carbon credits to offset pig iron plant emissions – resulting in “Net Zero” carbon pig iron



- ✓ Generates base load renewable power

REPLACING COAL WITH ABUNDANT, LOW COST RENEWABLE BIOMASS



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- 1** To produce Green Pig Iron, Magnum uses biochar to replace coal.
- 2** By removing coal and using a renewable, low-cost input, Magnum's product achieves Green certification
- 3** The proximate abundance of biomass further contributes to small carbon foot prints with reduced logistics costs and processing.



DELIVERING TO PREMIUM USA & INTERNATIONAL STEELMAKERS



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<p>Low Cost Iron Ore</p>	<ul style="list-style-type: none"> • Fully permitted iron ore mine • Only iron ore operation in the Mineral District for additional resources • Large water permits
<p>Pig Iron Advantages</p>	<ul style="list-style-type: none"> • Will be the Only pig iron producer in Western USA • Surrounded by 7 million tons of EAF need stable pig iron supply • Minimum logistic cost by value adding at site • Easy access to electricity and natural gas
<p>Readily Available Logistics</p>	<ul style="list-style-type: none"> • Ready access to railway and highway via Coledo property • Ports in California are standing by to export to East Asian green pig markets of Japan, Korea, Taiwan • Union Pacific Railway is supportive of Green projects
<p>Green Initiatives</p>	<ul style="list-style-type: none"> • Abundant local biomass for renewable biochar • Small logistic carbon footprint • Global decarbonization • Large carbon credit and tax incentive potentials
<p>Premium Products in Demand</p>	<ul style="list-style-type: none"> • Global expansion on EAF steelmaking • Severe pig iron supply shortage • Export restrictions are in place for major economies • Magnum will be one of the very few Green pig iron producers

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FOR MORE INFORMATION

Contact:

Neil Goodman, CEO
neil@mmel.com.au

Anoosh Manzoori, Chairman
info@mmel.com.au

KG Capital Partners

Justin Klintberg
jk@kgcapitalpartners.com.au

Tom Gunnensen
tg@kgcapitalpartners.com.au

Registered Office:

Level 11, 52 Phillip Street,
Sydney NSW 2000

Telephone: +61 8 6280 0245

Fax: +61 8 9381 2855

Email: info@mmel.com.au

ASX: MGU

ABN 70 003 170 376

www.mmel.com.au



MGU

The **Green** Pig Iron Company



MAGNUM
MINING & EXPLORATION LIMITED

**NEVADA
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