



HEAVY INDUSTRY
LOW-CARBON
TRANSITION
COOPERATIVE
RESEARCH
CENTRE

M10504/M10522

UPGRADING OF IRON ORE FOR DRI PRODUCTION USING PRODUCTS FROM SEAWATER RO BRINES

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20 August 2024



ROM iron ore grades



Increased transport cost/iron value

Impurities reporting to slag lead to increased waste

Impurities reporting to metal lead to higher production costs

Demand for high-grade iron ores



Lower GHG emissions and energy costs per ton of hot metal



Desalination



Increased potable water demand is served by reverse osmosis desalination plants





Blast furnace route



1.9 ton CO_{2e}/t hot metal*

Impurities reporting to slag lead to increased waste

Impurities reporting to metal lead to higher production costs

EAF-DRI(gas)



0.9 ton CO_{2e}/t hot metal*

EAF-DRI(H₂)



0.025 ton CO_{2e}/t hot metal*

- DRI production with H₂ set to grow from 8 % to 24 % of global steel production by 2050 (MRIWA Green Steel report, 2023)
- Requires high grade ores, > 67 % Fe grade

PROJECT CONCEPT

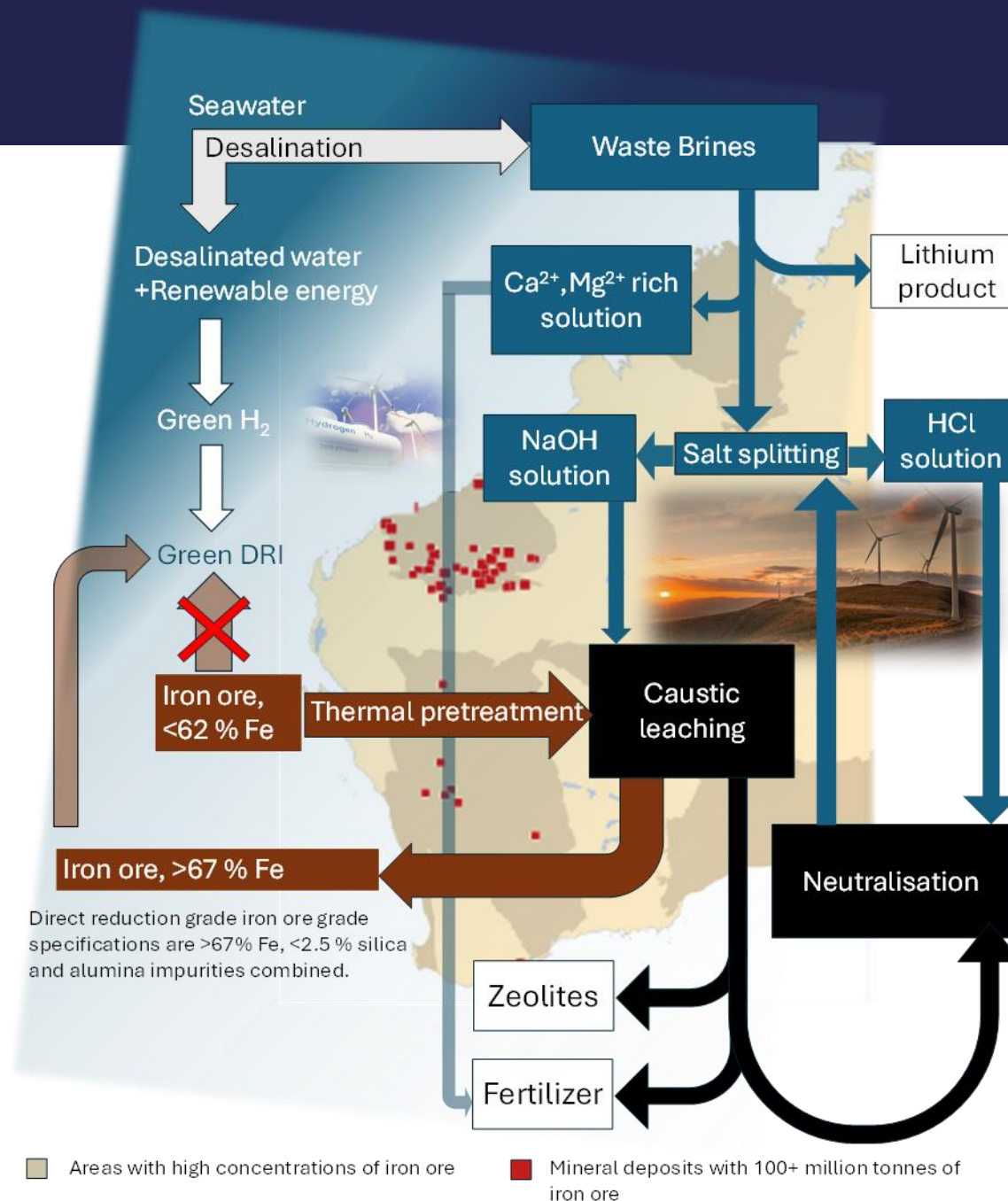


Use renewable energy & reagents from seawater desalination brines to upgrade low-grade iron ores

Support potable water production by eliminating brine disposal costs and impacts
Recover valuable by-products from brine and leachate

No need to purchase large amounts of reagents
Using what nature offers
Process development towards a Circular Economy

DE-RISKING DECARBONISATION FOR HEAVY INDUSTRY





3 - year research program

2 – year commercialisation phase

Lab and mini-plant experiments

Confirm operating windows

Partial integration testing

Build skills in relevant topics



Flow sheet optimisation and techno-economic assessments

Early identification of risks

Direct research to critical aspects

Costing of pilot plant

Identify relevant pilot scale or minimum feasible pilot scale

Determine cost of further development

CONCLUSIONS



Australia is uniquely blessed with mineral resources, access to seawater and access to renewable energy sources. Our project proposes a hydrometallurgical upgrade route for low-grade iron ores to produce DRI grade iron ore products and potable water.

The project is challenging in its scope and scale. Support from MRIWA and other project funders allows us to derisk this process route and confirm its feasibility by demonstrating partial integration of the process and working towards a full-scale pilot plant.

Enabling H₂-DRI-EAF route

- Removing low-temperature stickiness of goethite ores (Thermal pretreatment)
- Remove high-temperature stickiness by removing silica and alumina

Foster skills needed for green iron and steel development in WA



ACKNOWLEDGEMENTS

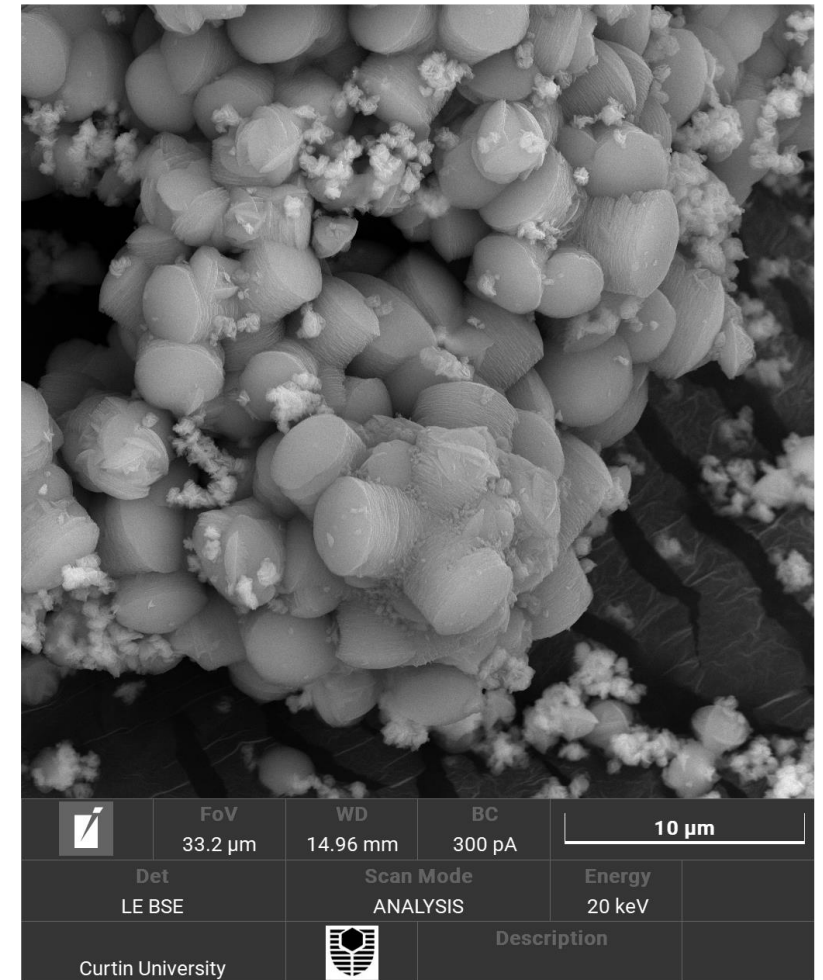


The work has been supported by the Heavy Industry Low-carbon Transition Cooperative Research Centre (**HILT CRC**), whose activities are funded by its industry, research and government Partners along with the Australian Government's Cooperative Research Centre Programme.

This work was supported by funding from the Mineral Research Institute of Western Australia (**MRIWA**) grant M10522 & M10504.

We acknowledge that financial support from **Curtin University** has helped make this research possible.

This Project received funding from the Australian Renewable Energy Agency (**ARENA**) as part of ARENA's Advancing Renewables Program.



Zeolite crystals from caustic leachate



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