Ex-Fortescue duo's green-iron play

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Body

Two of the original architects behind ***Fortescue***'s clean energy pivot believe their start-up can solve the carbon footprint of the Australian iron ore industry without using the hydrogen and membrane technology being popularised by their former employer.

One of ***Fortescue*** chairman Andrew Forrest's most senior lieutenants of the past 25 years, Michael Masterman, has joined forces with former ***Fortescue*** chief scientist Bart Kolodziejczyk to create a metals processing start-up that is already turning iron ore into pure iron at laboratory scale.

Dubbed Element Zero, the new company has a patented method of "electro-reduction" that uses an alkaline solution and electric current to separate pure iron from the waste products in iron ore such as silica, alumina and oxygen.

Mr Masterman and Mr Kolodziejczyk say Element Zero's patented process can work for the hematite ores that dominate the Australian iron ore industry, plus other metals such as nickel.

"Everything we do was developed after ***Fortescue*** and doesn't bring anything from ***Fortescue***," said Mr Kolodziejczyk.

Element Zero is part of a rush to develop "green iron" technologies that could help Australian miners reduce the scope 3 emissions created when their customers cook iron ore and coking coal together to make steel.

The oxygen in iron ore combines with the carbon in coking coal during the steel-making process to make carbon dioxide.

Big miners Rio Tinto, ***Fortescue*** and BHP are investigating future options to export pure iron from Western Australia rather than iron ore, by removing the oxygen and other waste products.

Pure iron has traditionally been extracted from iron ore in some parts of the world using the potent greenhouse gas methane, under a process called direct reduced iron.

Miners such as ***Fortescue*** have studied whether they can make carbon-free DRI by using green hydrogen rather than methane to remove the oxygen.

But experts have warned that converting the Pilbara iron ore industry to hydrogen DRI would be extremely expensive, costing up to $30 billion and requiring the installation of enough renewables to double Australia's power generation capacity.

Hydrogen DRI also struggles to work on the hematite ores that dominate the Australian export industry.

Part of the breakthrough at Element Zero "is being able to show that we can process the iron ore of all the majors and all the magnetite miners," said Mr Masterman, adding that the company had trialled ore from several miners, including ***Fortescue***.

"Importantly for Australia's future, because iron ore grades are coming down, our technology works very efficiently on the currently sub-economic, sub-55 per cent iron ores."

Under Element Zero's process, iron ore is dissolved into a clear, alkaline solution that does not include water. When renewable electricity is passed through the solution, the pure iron plates on to a cathode, from where it can be collected for sale.

Element Zero is commissioning a green iron pilot plant in the Perth suburb of Malaga, where 100 kilograms of iron ore will be fed into the process each day.

Mr Kolodziejczyk received an Order of Australia in 2022 for services to hydrogen energy science.

But he said the lack of hydrogen in Element Zero's process was an advantage because it lowered capital costs and allowed for a more direct and efficient use of renewable power.

Fortescue announced last February that it had developed a method for making green iron without requiring hydrogen, but Dr Forrest said that breakthrough was based on ***Fortescue***'s secret membrane technology.

Mr Masterman said he believed technologies reliant on membranes would be hard to scale up, and stressed that Element Zero did not use membranes.

"If you want to build a plant that is say 5 million tonnes per year, you can't pass 5 million tonnes a year through a very expensive piece of plastic," he said, in reference to membranes.

Mr Masterman's association with Dr Forrest goes back to the late 1990s when he was the finance boss at troubled miner Anaconda Nickel.

He later held senior roles at ***Fortescue***, including as international projects boss, before serving as chief financial officer and chief investment officer within ***Fortescue***'s Future Industries division between 2020 and 2022.

He was also chairman of Dr Forrest's private company Squadron Energy until late 2021; Squadron is now Australia's biggest owner of renewable power assets.

During their time at FFI, Mr Masterman and Mr Kolodziejczyk were among the small group that spent most of 2020 travelling on Dr Forrest's private jet to more than 30 nations on the hunt for clean energy projects.

Mr Masterman said leaving ***Fortescue*** better enabled him to focus on a smaller number of projects.

"There became a point in time where, for me, [there were] too many time zones; let's come back and focus," he said. "So I stepped back in 2022 and focused on where there are opportunities for very, very large-scale decarbonisation."

Some of the green iron technologies being pursued by ***Fortescue*** were developed by Mr Kolodziejczyk during his time at the company, and his name is still on some ***Fortescue*** patents.

Asked why he did not pursue Element Zero's electro-reduction method while working at ***Fortescue***, Mr Kolodziejczyk said the idea had not dawned on him until later. "You actually had to step out of ***Fortescue*** to brainstorm, ideate and develop a pathway," he said. "We tested it in our garage initially to make sure it works.

"We can move significantly faster being a small start-up company."

Mr Masterman said he hoped Element Zero could have a good working relationship with ***Fortescue*** in the future.

"We need a broad church to be successful here," he said.

"There are enormous incentives for the major iron ore companies to solve this problem and enormous incentives for the major steel companies to solve this problem.

"We want to be in a position, with the support of the full industry, to be able to deploy at scale quickly."

Element Zero was registered with ASIC in December 2022 and raised $9 million from US venture capital fund Playground Global in August.

The money was part of a $10 million raising that will help fund studies on a larger plant that would consume a tonne of iron ore per day.

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