FINANCIAL REVIEW

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This man is using 'pixie dust' to solve green hydrogen's big problem

Professor Greg Metha and Fortescue might have a solution to Saul Griffith's fear that Australia will waste time, money and renewable power making green hydrogen.

For a bloke devoting his career to hydrogen, Professor Greg Metha has a surprising amount of sympathy for Saul Griffith's view that Australia will waste its renewable energy resources if it focuses too heavily on making green hydrogen.

"Right now when we're screaming for as much electrons from renewable energies as we can [get], I just can't see how it's going to be economically viable to use a significant proportion of that electricity to make hydrogen," he tells this week's Tech Zero podcast.

"That's why I think the delay for bringing in hydrogen is going to be much longer than people are anticipating."

But that's also why Metha has developed a green hydrogen manufacturing method that does not require electricity.

In a laboratory at the University of Adelaide, Metha works behind protective curtains that shield passers-by from the dangerously intense beams of light that he uses to make hydrogen gas with no carbon emissions and next to no power bill.

It's a tweak on the old concept of photocatalysis; a process where photons of light cause a chemical reaction when they make contact with a catalyst.

In Metha's lab, the photons make contact with small metal particles suspended in water and the end result is bubbles of hydrogen and oxygen that rise out of the water and escape at its surface.

While power is needed for the lamp that shines intense light into the water – it can produce a beam as strong as 1000 suns – the lamp is only a proxy for now.

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Metha's project is based on the idea that sunlight will be concentrated via mirrors to make hydrogen via photocatalysis.

"It doesn't rely on the generation of electricity. It doesn't rely on any electricity market. It doesn't rely on purchasing large capital equipment, such as electrolysers," he tells Tech Zero.

"At its very simplest, it's just some water, some sunlight, some mirrors, and a very special photocatalyst."

Titanium dioxide – a product that starts with the feedstocks mined by the likes of Iluka Resources and Rio Tinto – is often used as a photocatalyst, but Metha would not reveal the exact ingredients in the photocatalyst he is using.

"It sounds like pixie dust ... but it's very, very sophisticated pixie dust," he says.

If Metha's photocatalysis method can work, it shapes as a neat solution to the debate Griffith sparked at The Australian Financial Review Energy & Climate Summit in October, where he warned that Australia had "drunk the Kool-Aid" on green hydrogen, which is a flammable gas with zero carbon emissions.

Greg Metha used to work the spotlight for a rockband. Now his hydrogen project has him centre stage. **Ben Searcy**

Griffith argued it would be more efficient – financially and environmentally – to put renewable energy into the power grid and electrify as many aspects of urban life as possible, rather than prioritise those renewables toward the making of green hydrogen.

"I would completely agree," says Metha, when asked about Griffith's comments about prioritising electrification.

"The bulk of the decarbonisation must come from electrification, it's the cheapest way of removing our reliance on carbon. That said, if we need to go to zero emissions by, everyone is saying 2050, then there are some sectors that are just impossible to decarbonise with electricity.

"That is heavy industry, and it's also long-distance transport, whether it be for freight or for people, and that's where you need a fuel because a fuel has an incredible energy density compared to electricity.

"There are a whole lot of other chemical processes that you can't do without the hydrogen. So we need the hydrogen,

"We think there's an advantage to it [photocatalysis], because it bypasses the requirement for electricity.

"The cost of green hydrogen from electricity is almost always going to be linked to the cost of the electricity through the grid and also the large cost of the electrolysers themselves.

"So we're trying to remove all of that and make it as simple as possible."

Metha's technology is not yet ready to be adopted on an industrial scale; he is still perfecting some details such as the optimum concentration of light to shine on to the water.

But it is sufficiently advanced to receive patents and investment from Fortescue Metals Group's clean energy division – Fortescue Future Industries.

Handy diversification

ASX listed clean technology developer Sparc Technologies is also involved in the joint venture between Fortescue and Metha's work.

Metha's method could provide Fortescue with some handy diversification; the company is building a factory at Gladstone that will manufacture proton exchange membrane (PEM) electrolysers.

PEM electrolysers are one of the two dominant types of electrolysers in the world today, alongside alkaline electrolysers.

Both require renewable power to split water into hydrogen and oxygen, and both suffer some energy losses in the process of turning renewable power into hydrogen.

But despite the concerns about whether electrolysers are the best use of renewable power, the world's biggest electrolyser manufacturer, Nel, does not fear disrupters like Metha.

"You read all these articles about interesting technologies. But, you know, we have to realise it's really lab technology, it's lab work," said Nel chief executive Hakon Volldal in an interview with The Australian Financial Review in October.

"To take that and then, you know, produce one gigawatt for a steel factory won't work. Maybe in eight to 10 years they will be there, but the runway is pretty long on these new technologies."

Volldal said Nel was also experimenting with new methods of making hydrogen and knew from experience how long the delivery path was.

"I think there are 30 or 40 different technologies, only two have actually been proven at scale," he said.

"To take something with, let's say, a membrane the size of a stamp and then scale that up to something which is really big and can help you at the industrial scale, that takes years.

"So if you want to buy something today, for a [hydrogen] project that is realised in 2025, 2026 or 2027, you only have two options. That's PEM and alkaline."

But Metha says he is driven by a desire to leave a positive legacy and a nagging concern that the world is not moving fast enough on alternative green hydrogen manufacturing methods.

"That's why I started heading in this direction, because I could see that it was necessary ... and I looked around me and I saw nobody else doing it and I said, 'Well then, it's got to be me'," he says.

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