Is the future hydrogen-powered?

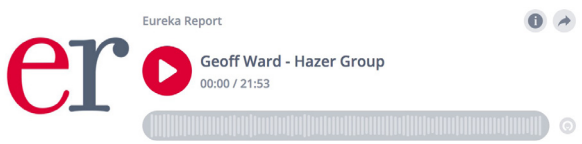
Alan Kohler speaks with Geoff Ward, the CEO of Hazer Group, about protecting their progressive Hazer process and how biogas will power their future profits.

ALAN KOHLER • 24 OCT 2019

Geoff Ward is the CEO of the Hazer Group. I think it's the only hydrogen-producing company listed on the ASX and it makes hydrogen from methane. It's got a process that was invented at the University of Western Australia and they have also got a deal with the University of Sydney; but the Hazer process converts the methane molecules into hydrogen and carbon which they turned into graphite for sale. It's a process that basically they're trying to sell to companies that have got waste methane, or waste tips, or sewage farms and so on, that have a lot of waste with a lot of methane being produced. The idea is that they'd be able to convert that waste methane into energy at the same time as getting carbon credits for the company concerned.

It's not the main idea for generating hydrogen, which is obviously from water, but Geoff Ward reckons it's going to be complementary to that. The shares have popped up a bit lately, they were 30 cents in the beginning of September and now they're nearly 50 cents, so things are starting to move but this is a long way off. This company is a long way off positive cash flows and earning decent money. They're not going to have a commercial plant until 2021 and then it will take a while from there. This is a long term speculative company but if you're interested in hydrogen and making a long term bet on the future of transport and the idea that hydrogen will play a part of that, then Hazer might be worth a small flutter in.

Here is Geoff Ward, the CEO of Hazer Group.



Geoff, can I just start with cash and cash flow. As I understand the last quarterly I have seen which is for June you burnt a million dollars in the quarter, you started with seven, you ended it with 6 but you got 9.5 million from Arena, the government funding body. Have you actually got that cash yet or is that a commitment from them?

That's a forward commitment. Arena are primarily a grant funding agency supporting research development and demonstration of renewable energy technologies. That is future funds that we can call down as we build our Hazer Commercial Demonstration Plant, the first fully integrated fully operational commercial operation of our Hazer technology.

Was that quarter typical, are you burning about a million a quarter?

Yeah, that's fairly typical. We've got a fairly tight team, we've got a strong technicals in the R&D team, we've got sort of a small and lean administrative group. Our ongoing sort of underlying spend on business development and market development R&D and technical development is about a million dollars a quarter.

What's your cash planning look like? You're building the plant now, we'll get onto how that's being funded in a moment but do you expect that you'll need to raise some more money at some point?

As part of the financing plan for the commercial demonstration plan we'll probably utilise as many as 3 different financing streams. The Arena grant is obviously a cornerstone of that. We will also need to add more equity so we will need to raise equity to support both the construction of the plant and the operation of the company during that period. We are a recipient of R&D tax incentive rebates as well, we have averaged about 1 to 1.5 million per year over the last three years and that will increase as we go into the commercial demonstration phase, so that's another income stream that we can use as well.

How much will the plant cost you?

At this stage, we estimate a capital cost of just under $16 million. We're going now from FEED, front end engineering

and design, into detailed design and so we'll obviously firm that CAPEX up as we move from initial engineering to final engineering but we're estimating around 16 million dollars at this stage.

I think you said the Arena funding will account for about 40 per cent of that.

Yeah, that's about correct. The arena funding stretches over a number of years so there is an amount of funding which we can call on for support during the capital phase and then there's some additional funding we can call on during the operations phase. The Arena funding will supply somewhere slightly under 50 per cent of the requirement for the build of the plant.

How much do you expect to raise from the market and when do you think you'll do that?

We're formulating those plans with our board at the moment so I don't have a number that I can give you publicly now but we're looking to do that in the very short term.

Right, okay. Let's get onto the Hazer process. There is this thing you call it the Hazer process, what is it and how long has it been around, where was it invented?

The Hazer process is a hydrogen production technology and it's a way of making hydrogen without the CO2 emissions associated with traditional steam methane reforming technology. We take a methane molecule, either methane from natural gas or more appropriately often methane from biogas, gas that's come from landfill gas or wastewater treatment plants, and we transform that through the Hazer process through the use of an iron ore process catalyst into hydrogen and solid graphite. The technology originated in the University of Western Australia and since the initial work at the University of Western Australia, we have also had a research partnership with the University of Sydney which we continue onto today.

I recently spoke to Elizabeth Gaines, the CEO of Fortescue, and they're in a partnership with CSIRO to produce hydrogen and they're going to do it from water which sounds to me as a total non-expert that might be a better way to go because water is cheaper than methane.

Water is cheaper than methane but the electrolysis process that has so much focus on it, it requires a lot more energy than our process does. We see that our process is complimentary to this push for large scale electrolysis based hydrogen production. Professor Alan Finkle, the Australian Chief Scientist, is currently producing a national hydrogen strategy for Australia which is focussed on how we can achieve export opportunities in the future and they are primarily based on electrolysis, the splitting of water with a large amount of renewable energy. We think our process is a great compliment to that because we can work with customers to produce hydrogen from waste biogas close to where they use it, so taking gas from tips and wastewater treatment plants, converting it to hydrogen to fuel bus and truck fleets which are often located close to those large waste municipal facilities.

We see ourselves as really complimentary to that. We think we'll be very cost competitive with that because we use less energy and we take away feed stock and we produce graphite as an additional biproduct which can reduce the cost of hydrogen.

You're not seeing your process as an alternative to the water production process but as a compliment to it, is that right?

That's absolutely correct, Alan. In the future with the scale that's anticipated for the use of hydrogen in transport, in clean energy, in heating, in industrial processes, as a feed stock, as a clean feed stock for industries like ammonia, ammonium nitrate, explosives, then we think that there'll be room for a number of production technologies and it will be a matter of creating the best overall low-cost hydrogen supply system. That will include using biogas through a process such as ours that captures the carbon and the methane of graphite as a saleable product which will also include electrolysis. It may include other technologies which are still under development.

I presume therefore that your process for producing hydrogen is more expensive per tonne of hydrogen produced than the electrolysis of water, is that right?

We don't think so at this stage. The electrolysis process uses a very high amount of energy and that keeps the price at this stage reasonably high. That's coming down with the cost of renewable energy and the cost of electrolysers but we're very confident that we'll produce a lower cost delivered hydrogen by being a more efficient process through the efficiency introduced by our catalytic reactor and also by producing closer to customers so you have a shorter delivery chain.

And also because you've got some graphite to sell.

And because we have a graphite biproduct credit, absolutely, that's part of our cost equation also.

When you say close to customers and you mention that it's about biogas, is that right, and so you're saying what you can do is convert the methane that's produced from your customer's waste, is that what you're thinking about?

Yeah, that's correct. If we look at our Hazer commercial demonstration plant we have an MOU with the Water Corporation in Western Australia to build it on site at their Woodman Point waste water treatment plant. Major waste water treatment plants, major landfills of course already producing biogas which is either being flared or used to generate electricity which isn't a particularly efficient business model. When I say close to customers those biogas sites typically are in heavy industrial zones which also host transport businesses, municipal bus fleets, depots and other potential users of hydrogen. We're seeing that there's a really good overlap between where attractive customers are and where already occurring biogas sources are.

Right. The downside as it were of that is that firstly it's never going to be large scale for export and secondly your customers are generally going to be outfits that have got a lot of waste turning into methane, is that right?

I think the waste being available as methane is a positive, not a negative, and we're not as focused on the export model but the scale is actually very large, there is a significant amount of biogas produced in not just Australian cities but Asian cities, North American cities, particularly in Europe and particularly in agricultural regions where we can also include animal waste. This is where I see us as being complimentary to the large scale electrolysis rather than necessarily in direct competition with it. While we're not focussed on creating LNG scale projects which require many decades pay back and sort of tens of billions of dollars of capital we're focussed on creating a network of local hydrogen supply close to customers based on a waste resource.

We think that could extend to many hundreds of plants globally so while individual projects are not large it's more of a decentralised network approach to supplying clean hydrogen close to customers at low cost.

I wasn't saying it was negative I was just kind of looking at the difference I suppose.

Yeah, so it's more like a decentralised renewables model rather than a very large centralised power generation model so it has some elements of that decentralised network as well.

The idea would be that you have quite a large number of customers around the world, is that right, buying your process?

Yeah, either buying the process or buying hydrogen from us if we were to build and operate. We could either license to people, we could partner with people to provide operations catalysts and graphite services or we could actually partner with an infrastructure investor so that we owned and operated the plant with an infrastructure consortium and sold hydrogen to customers under a long term contract.

You'd better tell us what your patent protection is around the world.

We're pursuing four patent families, three primary technical patents and one innovation family. We have received two of the three full Australian patents in Australia and they're still proceeding through the international assessment process under what's called the IPT, international patent treaty process. They're proceeding through assessments as is set down by the process. We have received the first international patents, the first of the international offices, the South African office has recognised the patent. That's proceeding, at this stage, smoothly. It's a detailed and laborious process but so far we haven't hit any roadblocks.

When do you think you might start making some money?

That is the $64 million question and to a large extent, it depends on the pace of the uptake of the hydrogen market. Our first commercial demonstration project is targeted, we're targeting to have that in operation from January 2021. That will make a small amount of revenue but it will not turn us into a profitable company immediately. We're talking to initial customers about potential commercial-scale projects in Asia and we think they could follow on behind the commercial demonstration plant quite quickly but really we're awaiting and working with potential customers to see the development of a stronger hydrogen market and we think that's probably in the next couple of

years but it's hard to put an exact date on it right at the moment.

In particular, in Japan they've got a lot of hydrogen vehicles going on, is that right? Is there anywhere else that it looks promising for hydrogen?

Japan and Korea are key leaders and as are Germany, also there's some strong investment in various states in the US. Both Japan and Korea have put out really strong targets for the number of vehicles they want to see converted but there's still a relatively long term target. They have got national targets for conversions by 2030. Currently, there's a sort of significant discussion going on in all of those counties about how do we create the market for those vehicles, how do we supply them with infrastructure and how do we supply them with hydrogen.

We think that those plans will get a lot more concrete over the next year or two and that's the market we're looking to be ready to target through our commercial demonstration plan.

This is a big question but do you think it's possible that it's going to end up being an either or, a winner takes all between hydrogen and lithium-ion batteries? I'm wondering whether we might look back in 50 years or something and realise that lithium-ion battery technology for transport was a transitional process and we ended up with hydrogen.

Personally I don't think so. I think a better analogue is to think of diesel versus unleaded. Both hydrogen fuel cell vehicles and battery vehicles are electric vehicles, they essentially have an electric drive, electric motor, electric power controls, etcetera. I think a better analogue would be to think of unleaded versus diesel, that for small vehicles, lots of short trips, lots of downtime, always close to infrastructure, low power requirement, it's going to be very hard to see batteries not being probably the most efficient technology. For busses, long haul freight, for vehicles that have really high use times and don't have a lot of downtime for charging, for vehicles that require a much heavier power load and fuel load and are less close to infrastructure.

Intercity transport, regional transport, heavy freight, trains, buses, ferries, are all likely to be most efficient and have better solutions off hydrogen fuel cells because you can store the fuel in a tank and you can refuel it quickly. You can extend your range by extending the amount of storage you carry. I think it's more likely if I had to make a future technologist hypothesis that you'll see both battery-electric and hydrogen fuel cell vehicles working together as part of the electrification of transport. It will be maybe similar to the way unleaded and diesel work together now, it's really a combination between unleaded and diesel, they both have different places in creating efficient transport.

That's interesting. I must confess I didn't realise that hydrogen-powered cars and trucks were actually electric. Tell us how that works.

Absolutely, and that's a common misconception, that people think that hydrogen goes into some form of piston or spark engine. Hydrogen can be burnt in a turbine to make power but primarily it goes through a fuel cell and a device for making electricity on demand like an on-demand generator with no moving parts. In a hydrogen fuel cell car you have a hydrogen tank carrying your fuel the same way you have an LPG tank in a taxi fleet or something similar, but you have a hydrogen fuel cell that makes electric power on demand by mixing the hydrogen with oxygen and the only tailpipe outlet emission is water which is actually clean enough to drink. It's quite a novelty at car shows to drink the water from the tailpipe of a Toyota Mirai.

When you depress the throttle and you put your foot on the accelerator the fuel cell responds by making power, that passes through a small battery which manages the microsecond power requirements and goes into an electric engine and drive system essentially exactly the same as used in the battery electric vehicle. Rather than having a large bank of batteries you have a small battery, a fuel cell and a hydrogen tank.

How does the electricity get created?

It gets created through a fuel cell. A fuel cell you can think of as akin to a generator. A fuel cell physically looks a little bit like a battery, it's a cubic box shape, it's a large number of stacked plates of cathodes and anodes. Hydrogen goes in one side of the divider plate, air goes in the other, there's an exchange of electrons creating the current and the hydrogen and oxygen mix to form water. A hydrogen fuel cell produces electricity on demand the way a generator does by adding fuel to it but it has moving parts so they're very good for maintenance costs, longevity and reliability.

That's one of the things that I think is going to push the hydrogen transition, is that if you look at other technologies which involve no moving parts and which

are manufactured the obvious one that springs to mind is solar panels. We can see how quickly the price comes down with manufacturing economies of scale and with further tweaking and R&D

The economies of scale here would be in the fuel cells.

In every item of the hydrogen supply system. In the fuel cells, in the storage tanks, in the cars, in the transport modules and the tube trailers, the whole hydrogen supply chain is essentially made up of manufactured equipment like the wind and solar chain.

Right, interesting.

That brings the prospect of a big price drop.

Electricity is just created when hydrogen hits the air, is that right in some way?

Yeah. Hydrogen and oxygen mix in a reduction-oxidation reaction, it produces water and electricity. The reaction that happens in the fuel cell is essentially the reverse of the reaction that happens in the electrolyser. In an electrolyser energy is used to split water into hydrogen and oxygen, in a fuel cell, hydrogen and oxygen are recombined giving off energy and producing water.

There you go. I imagined with Hazer Group that what you were doing was buying methane from the Northwest Shelf or something but clearly that's not the plan, is it?

We certainly can buy methane out of a pipe, a large amount of our testing and piloting to date has been done on natural gas and LNG from a tank so we can operate on natural gas or biogas. We think there's an enormous benefit in operating on biogas because we get a large carbon abatement credit and we actually become a carbon-negative process working on renewable biogas. The Hazer process is one of our two key drivers is our how low carbon emission we are. We're making hydrogen in a very low carbon way.

If we operate on natural gas we capture the carbon as graphite so we're a form of carbon-capturing utilisation inbuilt to the process without having to deal with gas. We capture the carbon as a solid graphite particle and that reduces our emissions compared to steam methane reforming by between 60 per cent and 80 per cent, so a very large reduction. When we operate on biogas we actually get an additional credit for capturing and destroying biomethane which has a large global warming potential and so we actually get a carbon abatement credit we've calculated at between 100 to 150 tonnes of CO2 for every tonne of hydrogen we produce. We're actually minus 100 to 150 tonnes of carbon and that makes us even lower emission and with a better carbon balance position than electrolysis.

Is that a big part of your business model?

I think that's very much one of our selling points to these early uptake customers who are very focussed on doing both smart city infrastructure that maximises waste recovery, energy recovery and waste to resource utilisation. We're also offering them a carbon abatement, so a way to start reducing their overall carbon emissions at their operations while providing a supply of fuel cell grade hydrogen close to where they need it.

Right, very interesting. It's been great talking to you, thanks very much, Geoff. It's been very interesting, thank you.

It's a pleasure, Alan, I actually really enjoy your segments, and read and watch you often so it's been great.

Thanks a lot. That was Geoff Ward, the CEO of the Hazer Group.