Kathy Errington on green hydrogen

Edited transcript of The Policy Fix podcast interview with Kathy Errington, March 2019, recorded at Auckland University of Technology. The interviewer is Keri Mills.

KM: Nau mai whakarongo mai and *w*elcome to The Policy Fix, a podcast by The Policy Observatory AUT. Ko Keri Mills tēnei and today I'll be talking with Kathy Errington, executive director of the Helen Clark Foundation about her recent policy paper on green hydrogen.

Tēnā koe Kathy

KE: Thanks for having me

KM: So to start with, what is green hydrogen?

KE: Green hydrogen is hydrogen that's generated from renewable electricity. The first pilot plant in New Zealand, the construction began in January and it will be generated from geothermal. And the idea is in the medium term it will be exported to Japan. I worked on that as a diplomat when I was posted in Tokyo. And I guess my paper was inspired by that - because it could have a variety of implications for New Zealand.

KM: In a nutshell what is the case for green hydrogen?

KE: So the case for green hydrogen is both on environmental, and economic grounds - it's a potential new export industry for New Zealand, it's a way for us to export renewable energy. And it will help both New Zealand and other countries, particularly Japan, but potentially others to decarbonise.

KM: So what would we, or the Japanese, use green hydrogen for?

KE: So that's what I've looked at. The short answer is, Japan needs energy desperately - so for the Japan side the answer is a lot more self evident than it is for us. But there's going to be good answers to that for New Zealand too. Japan imports 93% of its energy. After Fukushima, in 2011, they lost a third of their generation overnight, when they took all the nuclear offline for safety testing. They've been able to refire up a handful of plants - I think when I left Japan at the end of 2018, it was only about five or six - because local communities, understandably, do not want a nuclear plant in their backyard. And they typically take out lawsuits when the plants are restarted. So even though the government has quite ambitious goals of getting the percentage of nuclear up to 20%,

22%, that kind of area, the odds they achieve that, I think personally, are quite limited, because the community opposition is so strong.

And so they replaced all that generation by importing fossil fuels - LNG and coal. That's bad for their climate profile, and very expensive, and a security risk, because the shipping routes that they get their oil through are the Strait of Malacca. I think more than 2/3 of the oil goes through the Strait of Malacca. So they've got a lot of drivers that means that they need to import energy, and that they need to diversify the places that they import energy from. Then when you combine that with the Paris Agreement, where they need to reduce their emissions by 80% by 2050, they need to also import renewable energy.

So the genesis of that project that's happening in the North Island now, is the combination of those two things: that Japan desperately needs renewable energy; and that New Zealand has a lot of renewable capacity that we are not using. And through hydrogen technology - you can now liquefy hydrogen and ship it - that's a way for New Zealand to export renewable energy.

KM: And is this likely to make New Zealand money?

KE: Yes, the people doing it, it's Tuaropaki Trust on the New Zealand end, and the Obayashi Corporation on the Japanese end. And of course neither of those are charities - they are driven by commercial interests. At the same time there are strong, I think, environmental principles behind why they're doing it. And both sides take that very seriously, as to why this is a risk worth taking. So I definitely think those environmental principles matter, both to the businesspeople, and to the governments that are supporting the project.

The other implication that I talk about in my paper is that that project would mean a big supply of green hydrogen would come online, here in New Zealand. We would then need to decide what do we do with it. And we need to really do that thinking now, because the plant will scale up in a couple of years, and we'll have it there. And if we haven't planned out, and actually set some targets, and put some framing around this nascent industry, we could end up not taking advantage of a new resource.

KM: So what might we do with it, what do you recommend in your paper?

KE: So I analyse it at a pretty high level, but the kind of things I talk about are: trains - it's worth looking at hydrogen trains. They are doing that in Germany. New Zealand never finished electrifying its railways, and it's very very expensive to do. So as the price of hydrogen is coming down globally with the trade getting started, it may actually be cost competitive to move to hydrogen trains.

Other uses… so there's a little bit of coal and gas generation in New Zealand that's really hard to get rid of, as we are moving towards no fossil fuel. In dry years where our hydro lakes are low, and we have spikes in demand, basically what happens is that the demand spikes, and we need to have more generation very quickly, and we do that with coal and gas at the moment. And that is one of the hardest parts to shift of fossil fuel generation, at the moment. But hydrogen actually offers the potential to get rid of that, and to go

entirely renewable. And it's because you can store hydrogen - you can store it as liquid. You can also make hydrogen when it's really cheap, because you can fire up and scale down the production of hydrogen easily. You could, for example, make and store a lot of hydrogen when New Zealand electricity prices are very low. New Zealand electricity prices change every 30 minutes, and at their lowest they're almost nothing. So you could make hydrogen cheaply, and have a stock of it to use during dry years. And that kind of technology offers ways for New Zealand to go 100 renewable in its generation.

The final proposed use I talk about is heavy vehicles, which are difficult to electrify. It's not that electric heavy vehicles don't exist, they do, but they typically take a long time to charge. And given the way that they're used in truck fleets, that presents a major barrier to actually using them. Many trucks, for example, are used nearly constantly. So the time where you have to take the vehicle out of service to charge it, is a practical barrier for businesses wanting to use them. And if you could use hydrogen, hydrogen refueling takes the same, if not less, time than diesel refuelling. It's in a tank on board the truck, so it can be done quickly. So there's potential there. There's potential for other kinds of heavy vehicles, like, say, tourist buses. And one of the reasons they make sense is that the big cost of being able to use a hydrogen vehicle, I guess the "barrier to entry" would be the proper term, is the need to have hydrogen refuelling stations. Those are very expensive, and I think it is probably unlikely that we will have them throughout New Zealand. So small vehicles will make more sense to electrify. But even with very few recharging stations, some kinds of transport could work with hydrogen. For example, tourist buses, that drive a set route, and return to base each day - and other kinds of return to base transport, trucks etc and forklifts and warehouses. They already have those in Japan, hydrogen forklifts. So there's a whole set of things that we can do with it, and that we need to be thinking about now.

KM: You mentioned that you came to this through a diplomatic role in Japan. Could you talk a bit more about that experience and how that led to this project.

KE: I was posted to Tōkyō, as the economic secretary, from 2015 to 2018. Before that I did language training in Japanese. Because I was the economic secretary I dealt with anything in the energy field. And this project was probably the most interesting thing I worked on, because of those long-term implications for New Zealand. And the Obayashi Corporation is not the only Japanese company interested in the hydrogen industry in New Zealand, but as far as I know it's the only one that's been publicly announced. So this interest is real, and is happening, and I'm interested in putting my view of it out there, as to what we should be doing.

I think the government's very interested in all of this, but there is just a fight, as there always is, as to how this is defined, and who's going to benefit from it. And the fight is over, to begin with, what kind of hydrogen we are interested in. That's the first question; it's almost a definitional question. And I argue in my report that we should support green hydrogen and not other kinds. Green hydrogen is generated from renewable electricity, and you can make a strong case that therefore it contributes to decarbonisation in a whole range of ways. But hydrogen is almost neutral, as an energy source, because it depends on the seed fuel. Right now 95% of hydrogen in New Zealand is made from natural gas. And there are proposals for new projects to make hydrogen from natural gas. They usually claim that they're going to use 100% carbon capture and

storage, but I'm pretty sceptical about that. I interviewed Greenpeace as part of my research, and they are sceptical altogether, of carbon capture and storage. They don't consider it a viable technology. I think you need carbon capture and storage, but you need it for the fossil fuels that already exist. It's not a good reason to seek new development of new fossil fuel projects.

The other point I make, that I think is actually really important, is that 100% carbon capture and storage claims about hydrogen projects globally, are almost never true. They're almost never actually doing it. There's a massive project called the Loy Yang hydrogen project in Australia, that's using brown coal, and it was marketed during the establishment phase as 100% carbon capture and storage. But then it wasn't economic to actually do it, during the pilot phase, so there is none. There is no carbon capture and storage at all. Best case scenario they might have some in 2030. But you look at other coal projects in Victoria and they've run into issues with storage. So you have big problems with those, just on a very practical level, around the world, and I don't think that's a useful direction for us to go, given how much renewable generation we have that we are not currently using.

KM: What's the likely impact on our emissions goals?

KE: Well I think if we go in the direction of green hydrogen it will be very positive. Because it's decarbonising things that have been really difficult to decarbonise like heavy vehicles, and that last little bit of coal and gas on the electricity generation grid. So even though in a way it's reasonably niche uses, they're important, because they are things that wouldn't decarbonise without it. But it will depend what kind of hydrogen we use, so there are various projects being considered using natural gas, and I'm pretty sceptical of those. Any new investments now made in gas risk being stranded assets. The hardest area for us is agriculture, and obviously hydrogen doesn't have a huge impact on that, although it could if it's renewable. The way we make fertiliser would become cleaner so it would have a small, pretty marginal impact on agriculture.

KM: So, there's been a bit of pushback, with people saying it is not a viable industry. What do you have to say to them?

KE: Well, most of the pushback I've seen has been from people that strongly support what I would say is the North American position in the debate about hydrogen. Globally you have the North American camp which wants to electrify everything, as a way to decarbonise, and then you have Japan which is championing hydrogen. Like I talked about earlier with their energy crisis, why Japan is doing what it's doing makes a lot of sense. But if you're in the United States, or if you're here, it can be hard to see that.

So as I understand the argument of a lot of opponents of hydrogen, both here in New Zealand, and in the United States, it's why would you waste all that energy? We have heaps of renewable generation. Why would you waste it to make hydrogen, when you could just use that energy directly, and it would be a lot more efficient? And I have a few answers to that.

The first one is: to decarbonise things that cannot, or will not be electrified. So that's things like heavy vehicles, where at the moment the electrification technology that exists does not meet the business needs of the people actually using trucks.

The second answer I give to those people who argue for just electrification, is that I think it ignores the massive and very sensible reasons why Japan is investing the way it is. Japan is investing enormous amount of money into hydrogen. They have set price targets to get hydrogen by 2030 down to I think it's 17 yen a kW - they have actual numbers attached to this which would make hydrogen cost competitive with gas, by 2030. They want to have 800,000 hydrogen vehicles on the road by 2030. So there's very serious, and costed, with real both government and industry money behind it, going into hydrogen at the moment in Japan. And for many of the New Zealand players I've seen talking about why hydrogen shouldn't happen here, I don't think they fully understand that. Because we are so close to Japan, we have so much to offer as an export partner. A very safe shipping route, relatively short, only 20 days, it doesn't need to go through any particularly dangerous stretches of water. And Japan needs to diversify its import base in general. So we have a lot to offer; it could be a big export industry. Once we have an export industry, there will be spinoff local industries as a result. So that would be my second reply to them, that they need to look really closely at Japan.

And then finally the answer to that is that there are some things that electrification will never do, and that's like that example I gave before about how there is a small proportion of electricity generation on the grid where we use coal and gas to deal with spikes in demand and hydrogen can be a possible replacement for that. So it's got a role to play dealing with intermittent renewables. I think the Mercury CEO op ed in the Herald claimed that New Zealand doesn't really have intermittent renewables, because we have so much geothermal. And while we have geothermal, and it's not especially intermittent, *everything* else is. Wind, hydro… So I don't accept that, it doesn't make sense. Our biggest risk is dry years, and hydrogen has a role to play there and that pushes that last bit of coal and gas off the grid. So, that would be my response to the sceptics.

KM: And what are your recommendations for government?

KE: I have six. The first one is that New Zealand should explore a green hydrogen export industry. Secondly that New Zealand should explore the potential for hydrogen rail. Thirdly that green hydrogen should be defined by its seed fuel, and hydrogen generated from renewable electricity is green and nothing else is. Fourth, green hydrogen should be analysed separately, and more aggressively supported by government, than hydrogen generated from fossil fuel. My fifth and sixth recommendations both relate more to the international aspect, because a lot of the international policy around hydrogen is also being made as we speak. So my fifth one is that New Zealand should actively build alliances with other countries that have an interest in clearly defining green hydrogen. And my sixth recommendation is that we push for transparency standards around the carbon impact of hydrogen. I think you can argue that both on environmental grounds, that it's better for global decarbonisation if we have transparency standards around this new energy source. But it's actually also very good for New Zealand because we have a massive advantage over probably any other country in the world, in terms of generating

green hydrogen for export. So that will benefit us both environmentally and economically.

KM: Kati anō i konei. Thank you very much.

KE: Thank you so much.

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