Australian Government
Office of the Chief Scientist

Interview:

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Chief Scientist Dr Alan Finkel was interviewed by Politico during his recent visit to Europe. Kalina Oroschakoff and Paola Tamma discussed hydrogen energy and its export potential for Australia with the Chief Scientist**.**

Topics: hydrogen energy, Australia's export potential

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Q and A with Australia's Chief Scientist Alan Finkel

The global push to cut greenhouse gas emissions could wreak havoc on Australia's coal and gas exports, which is why the country is keen on hydrogen.

Australia could use renewable energy to produce clean hydrogen by splitting water, or make it with coal and gas — although that does create worries about boosting carbon dioxide emissions, Alan Finkel, Australia's chief scientist, told POLITICO in Brussels earlier this month.

"We've reached parity with Qatar as the world's largest exporter of [liquefied natural gas], we are the world's largest exporter of coal, we're an energy superpower, and we have the potential to be, if not the largest, one of the most significant hydrogen exporters," Finkel said.

Although electricity is often seen as the key technology to get the world to decarbonize, hydrogen does have its advocates. They argue that the zero-emission fuel involves fewer compromises to existing energy and transport industries than electrification.

Why push hydrogen? The idea has been around for decades and hasn't really taken off.

Something's changed. First of all, it's the determination to decarbonize. The second thing is the plummeting cost of green, clean electricity generation. Solar and wind are just getting better and better; the sweet spot of making hydrogen at an economic level is when you can do electricity at about $10 per megawatt-hour. [But], it's going to be hard.

Can hydrogen be a substitute for natural gas?

If you're looking at heating houses, or running your stoves that run today on natural gas, what's the alternative? One alternative is, you electrify the heating, and electrify the cooking. But that has a lot of expenses associated with it. Also, if you try to heat your houses in the winter and you've gone on a fully renewable system, you've got the massive expense of storing. Studies do show that hydrogen substitution of natural gas is significantly less expensive than electricity substitution of natural gas.

What else could hydrogen be good for?

Clearly, there are occasions where electricity is not the most convenient form of energy. Think about maritime operations. At the moment, they're using bunker fuel which is the dirtiest kind of fuel. Hydrogen is really convenient for heavy-duty transport, in trucks, for trains, for shipping, and so it's an important part of the future economy.

How can clean hydrogen be made at scale?

You make it from water, with electricity, through a process called electrolysis. You capture the hydrogen, you compress it, you pipe it, you ship it, you sell it, you use it. The challenge is to do that at scale. We're talking about a swimming pool every second, or more. We're talking about massive quantities of electricity and water being converted into hydrogen.

What are the challenges facing hydrogen?

The first is ensuring that the industry operates safely. The second is costs. No one's done [green hydrogen] at scale yet. The third challenge is the one I've been talking here in Europe to people about. How do you get from demonstration projects to commercial scale? Who's going to buy commercial quantities of hydrogen if it's still expensive, and who's going to invest in producing hydrogen if there's no buyers?

What about coal? Is it a potential resource for making hydrogen?

It's not practical at the moment for black coal, because black coal, whether you like it or not, has huge international market potential, especially in Asia. So, they're not going to sell it cheaply for hydrogen production.

What's happening with lignite is that as coal electricity stations are closing, there's no other application. That coal is a wasted asset, has no international sales potential whatsoever. So, you've got a virtually free fuel, a well-known [gasification] technology which means you can make hydrogen quite cheaply and at large scale. The only challenge is CCS [carbon capture and storage]. There's been a 10-year science effort to identify offshore, under-the-sea bed, kilometer-down places to bury the carbon dioxide close to the coal fields. The projected economics are quite good.

How do you overcome environmental concerns?

Some of the people we've been talking with here, the officials, they are very concerned that communities will not be comfortable. But, in Japan, in Korea, other countries, they'd be

quite comfortable as long as the hydrogen has been certified through a traceable process to show that it was low-carbon dioxide emissions during manufacture.

How much solar and wind do you need to produce all that hydrogen?

We're talking a scale that you have not yet begun to comprehend. We're talking about solar and wind at 10 times the level that you would use to run your cities and everything else on electricity.

Australia generates 250 terawatt-hours electricity today, but we would build dedicated solar plants that are not even connected to the electrical system. And that would be over 1,000, maybe 2,000 terawatt-hours — massively big. The challenge is high. That's why, maybe, as we go forward, there'll be a need not just for solar and wind to generate hydrogen, but also for coal and natural gas to hydrogen. Norway is looking at natural gas to hydrogen, because they've got the ability to capture and store the carbon dioxide in the depleted oil wells.

How do you see a future global system for selling hydrogen working?

What we don't want to do is have a country produce hydrogen with massive carbon dioxide emissions. From the planet's point of view, we might be worse off. If you do properly regulated, developed and implemented CCS, in principle this could be as low emissions as solar- and wind-produced hydrogen. Studies are optimistic.

This interview has been edited for length and clarity.