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Developing a Green Future

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Focus area	Green Hydrogen - A Game Changer: how it could fuel our future and help solve the climate crisis
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Introduction

With the spotlight increasingly on the ways in which we an develop a green future, a big focus is on reduced emissions and alternate fuel sources. Making waves in this space is green hydrogen. The universe's most abundant element is among the hotter topics across the world.

So, let's start with looking at what hydrogen is – hydrogen is a chemical element with the symbol H and atomic number 1. Hydrogen is the lightest element and is known by the formula H_2. It is colorless, odorless, tasteless, non-toxic, and highly combustible. Hydrogen is the most abundant chemical substance in the universe, constituting roughly 75% of all normal matter.

Different types of energy can be used to produce different types of hydrogen:

- Green – renewable energy
- Brown – brown coal
- Black – black coal
- Grey – gas
- Blue – any fossil fuel with carbon capture and storage
- Clean – a recently coined (and considered a misleading term) that could describe either 'green' or 'blue' hydrogen

When produced, green hydrogen leaves only water and heat as by-products. Less than 1% of global hydrogen production is green hydrogen.

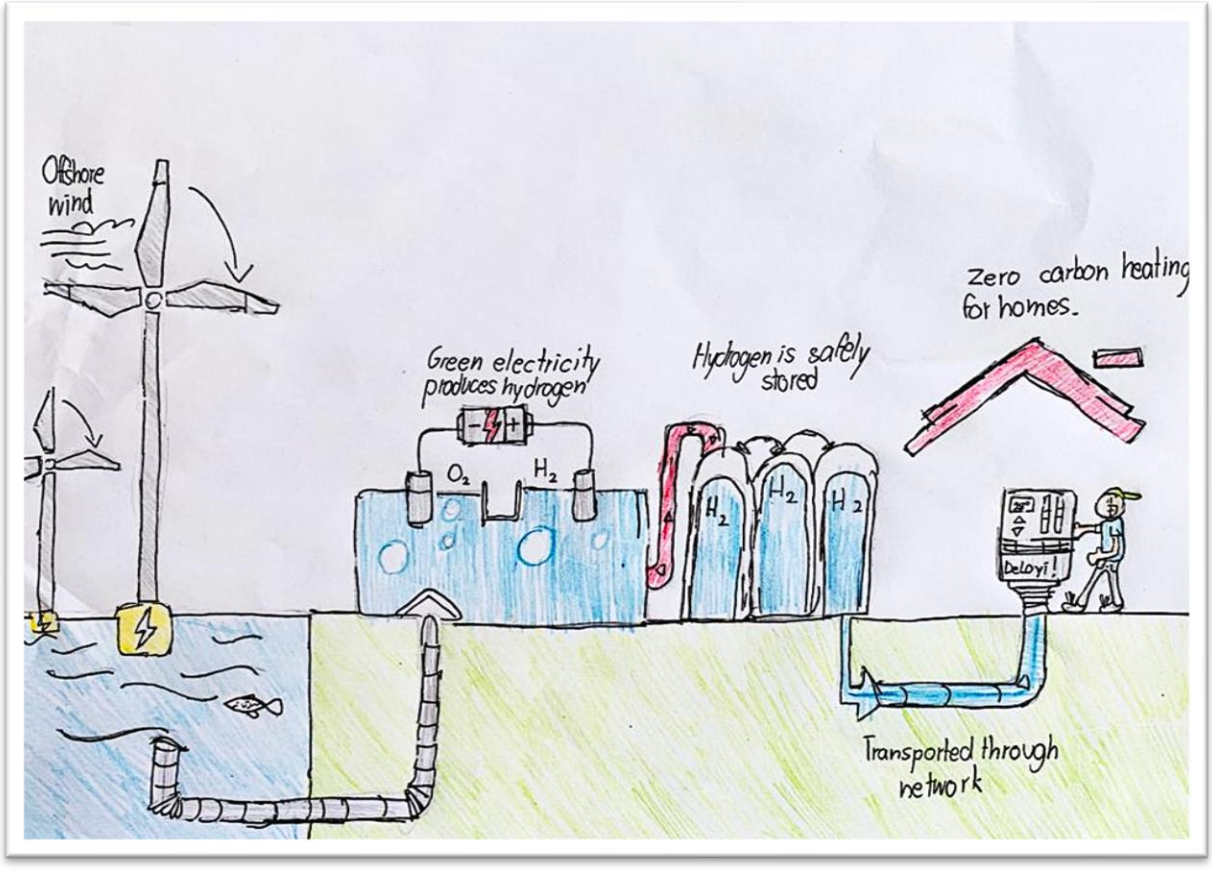

Diagram A - How Green Hydrogen is Made

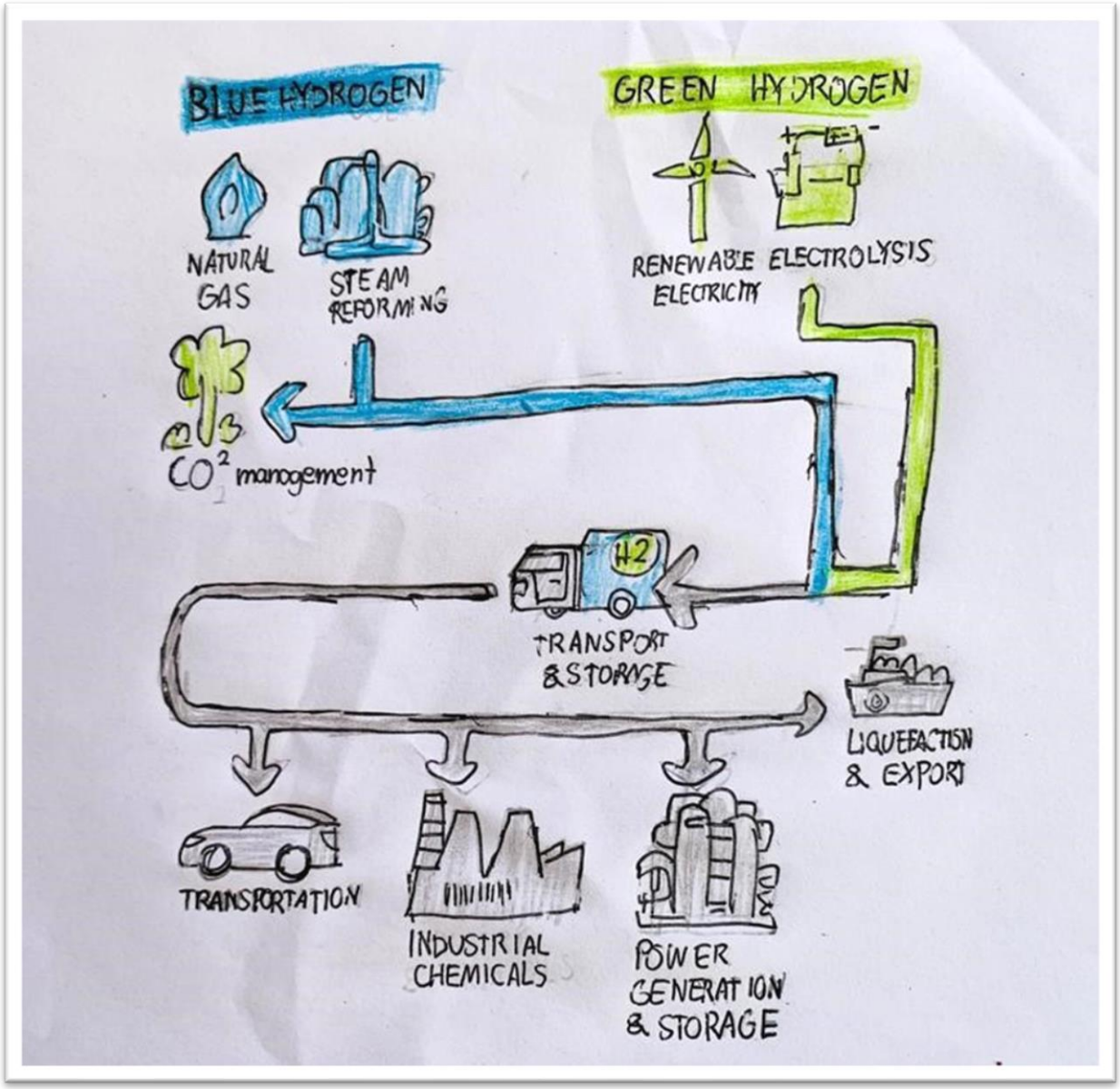

Diagram B - Difference between Blue and Green Hydrogen

The Green Hydrogen Revolution and Its Potential

What makes hydrogen a big deal is the diversity of its potential uses. Green hydrogen can expand the use of solar and wind power. Right now, you can't put solar or wind power into your car or a plane. However, green hydrogen created by solar and wind power has the potential to do that, when it is produced using an electrolyser that is powered by renewable electricity (an electrolyser is a device which splits water into hydrogen and oxygen using electrical energy). See Diagram A.

Green hydrogen isn't a stand-alone solution — it would be used along with electrification to head toward net-zero carbon emissions by 2050. It provides a green alternative for industries that can't adapt to electrification, such as long-haul road transport.

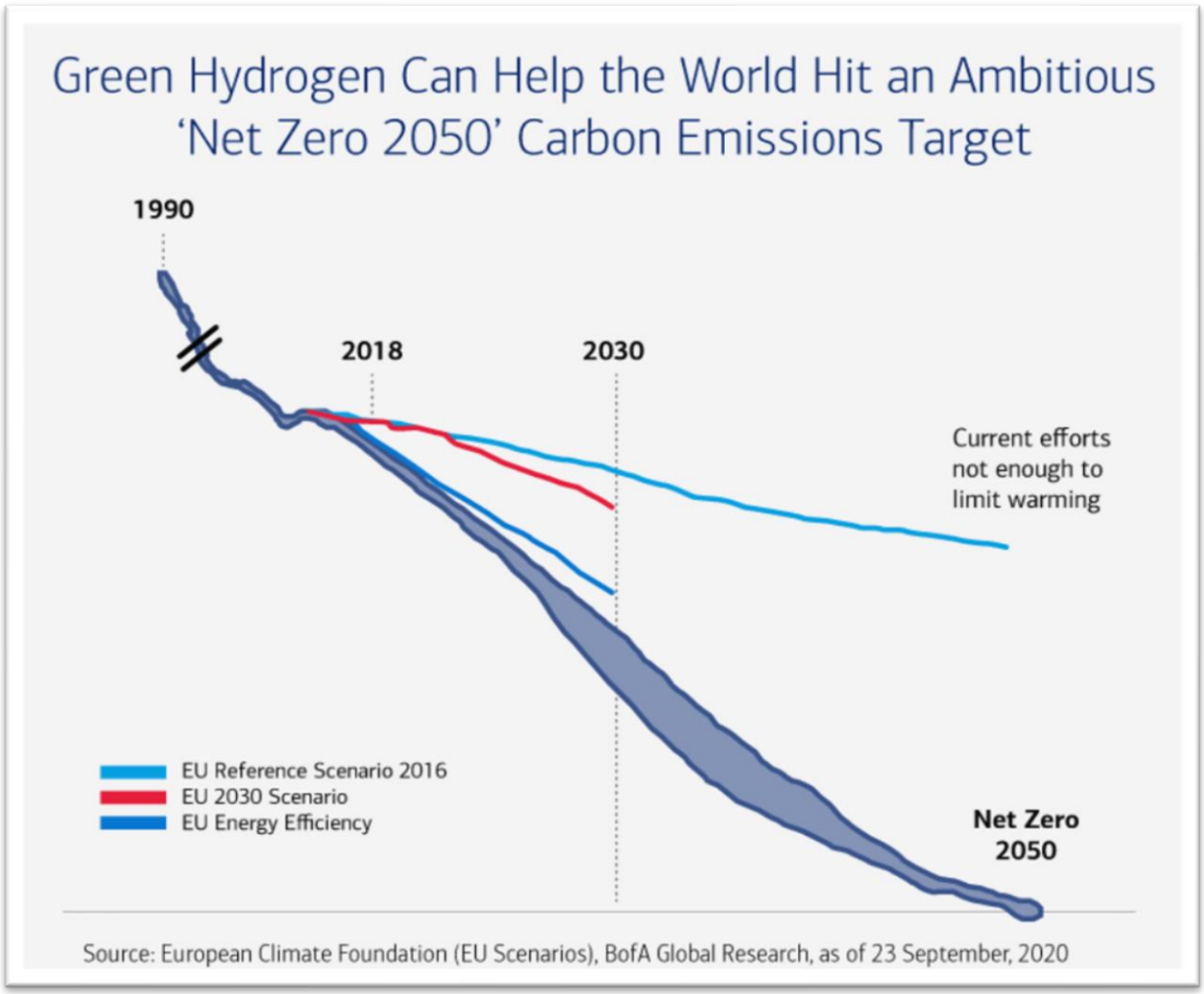

Diagram C - Green Hydrogen and the Net Zero 2050

Let's look at the potential of green hydrogen revolution to become a reality. The key reason green hydrogen hasn't scaled is cost. Right now, it costs $3 to $7 per kilogram to produce, compared with $1 per kilogram when made with fossil fuels. But three factors make it possible to bring that production cost down to between $1 and $2 by 2050.

First, the cost of electrolysers used to create hydrogen has dropped 50% in the last five years, and it is expected to fall at least another 60% to 90% by 2030.

Second, we're seeing technological advances that should further reduce costs. Over the coming decades, you could see green hydrogen playing a role in heating our homes and powering fuel cells for our cars, trains, ships and planes.

Third — and this is possibly the most critical incentive for a green hydrogen economy — governments are buying into it. In July 2020, we saw the European Union make its European Hydrogen Strategy the centrepiece of its Green Deal. Australia, Japan, China, and UK all have green hydrogen strategies.

Green Hydrogen in Australia's future

Clean, green hydrogen is a priority technology in Australia's Low Emissions Technology Statement. The Australian Government is working towards a hydrogen economy that can generate over A$11 billion a year by 2050.

Mitsubishi Heavy Industries is investing in Australia's largest green electrolyser. This is called the Eyre Peninsula Gateway Project, costing A$250 million. The Gateway expects to start producing green hydrogen and ammonia by the end of 2022.

Where do we go from here?

Green hydrogen has featured in a number of emissions reduction pledges at the UN Climate Conference, COP26 and is acknowledged as an important pillar of a net zero economy.

As per experts, the three steps to bringing hydrogen to life are firstly, expand renewable capacity quickly by increasing capacity. The UN announced its initiative The Green Hydrogen Catapult which would increase the capacity of green electrolysers from 25 gigawatts to 45 gigawatts.

Secondly, they need to electrify everything possible. Energy use from buildings and from transport represent almost a third of all CO2 emissions and should be decarbonized as quickly as possible. The most sensible way to do this is through electrification, switching fossil fuel with renewable energy, such as replacing petrol/diesel cars with electric cars and gas boilers with heat pumps. But it is critical that the electricity that powers these electrified applications must also come from renewable resources. Otherwise, the decarbonization impact remains minimal.

Thirdly, Hydrogen as a final step - Once renewable energy capacities rise, green hydrogen should play a key role in decarbonization, particularly for industries that cannot be electrified such as long-haul road transport, maritime shipping and aviation. Additionally, sectors currently using grey hydrogen (e.g., steel, cement and chemical industries) should transition to the green alternative.

Conclusion

Experts say it will be a long road. We're talking about a long-term transformation of the global energy system, which will challenge some industries and benefit others. Some experts are confident that green hydrogen will become part of human life, like fossil fuels are today. The need to develop a green future is now accepted as critical for sustaining future generations of humankind.

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