Why Green hydrogen?

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Hydrogen fuel cell technology was invented by Welsh scientist William Robert Grove in 1839 but had to wait until the 1960s for NASA to put it to commercial use to power its probes, satellites and space capsules. These days, much of the world is pinning its energy-transition hopes on green hydrogen as fuel source. Why is this important for South Africa? The reasons are many, varied and compelling.

In extremely simple terms, hydrogen is produced when an electric charge splits water molecule into hydrogen and oxygen in an electrolyser. Hydrogen is an energy carrier that can be used to generate electricity either indirectly by generating heat through combustion, or directly through an electrochemical process that takes place in a fuel cell. In both cases, water is the only by-product of the energy generation process.

Hydrogen is not in itself a green or renewable energy because the process to produce it is electricity intensive. Green hydrogen, therefore, is hydrogen produced using electricity from any renewable energy sources e.g. wind, solar, hydro etc.

The media and literature refer to multiple colours of hydrogen across the spectrum. This has nothing to do with the colour of hydrogen gas which is colourless, it has to do with the source of energy used to produce the electricity for the water splitting process. Thus, depending on the type of energy used, different colour names are assigned to the hydrogen produced, for example hydrogen produced using steam reforming from natural gas (methane) is named “grey hydrogen”, this is currently the most common “colour” of hydrogen.

Hydrogen is a highly versatile energy carrier that can be used in a wide range of applications. It is also understood how to safely store and transport the gas. As such, it has the potential to decarbonise traditionally ‘hard-to-abate’ sectors such as heavy-duty transport, aviation and maritime, and industries like steel, cement and ammonia manufacturing that cannot be fully decarbonised through renewable energy and direct electrification or through renewable energy with battery storage.

Why should South Africa focus on green hydrogen?
Firstly, because it is technology that can help the country towards achieving net-zero carbon status by the 2050 target date, and because South Africa already has a well-developed expertise in the Fischer-Tropsch technology.

Secondly, and at least as important, are the opportunities to industrialise the economy that green hydrogen can create, given that South Africa is home to some of the most important raw materials needed to produce it. These are platinum group metals (PGMs) and abundant sun- and wind-energy resource, along with the land on which to establish industrial-scale renewable energy (RE) plants. PGMs are used extensively in the manufacturing of the membranes and catalysts in electrolysers – and South Africa has the world’s largest resources of these metals. South Africa can also be a major exporter of green ammonia (a carrier of green hydrogen) to Europe and the Far East.

The combination of these resources, as well as the anticipated local demand for green hydrogen created by carbon-intensive industries, makes the country an attractive base for OEMs (Original Equipment Manufacturers) to establish manufacturing plants for the components needed to build RE plants and produce green hydrogen. In addition, South Africa has an established manufacturing industry, expertise in the production of synthetic fuels and a vast labour force that is "completely trainable", in the words of the country's Green Hydrogen Commercialisation Strategy.

Local manufacturing creates jobs, energy self-sufficiency and security, and export opportunities, all of which are needed to ensure an energy transition that is not only just but delivers tangible socio-economic benefits to all South Africans.

Green hydrogen state of play

Global demand for hydrogen reached an estimated 90 million tonnes in 2020 and is expected to grow to between 500 million and 680 million tonnes by 2050. Of this, the export market will account for 100 million to 180 million tonnes.

Given this potential, South Africa's nascent green hydrogen economy is being studied and structured from different angles.

In June 2021 the Minister of Trade, Industry and Competition established the Green Hydrogen (GH2) Commercialisation Panel, which is led by the Industrial Development Corporation (IDC). The panel has private and public sector members and, drawing on the Hydrogen South Africa (HySA) programme and the Hydrogen Society Road Map (HSRM), developed South Africa's Green Hydrogen Commercialisation Strategy and Action Plan that was approved by Cabinet in 2022.

Over the past few months, Infrastructure SA, a programme within the ministry of public works, identified a pipeline of 19 green hydrogen projects valued at more than R300 billion. The IDC also secured €23 million in grant funds from the German government to support the development of South Africa's green hydrogen economy and help accelerate the country's transition to renewable energy.

The notion that, in this process, we could grow into a significant supplier of the raw materials, technology and product the world needs to clean up its energy act, is an exciting and inspiring goal to unite behind for the nation.

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