UNLOCKING OPPORTUNITIES FOR GREEN SHIPPING IN AFRICA
15 FEBRUARY 2023
OUTLINE

1. SETTING THE SCENE
2. COUNTRY INVESTMENT STRATEGY
3. CATALYTIC INITIATIVES
Green H₂ production and classification

Green H₂ is made from the electrolysis of water using RE to split the water molecule into its H₂ and oxygen components. It produces no net carbon emissions in production and use.

There are 2 main electrolyser technologies used to produce green H₂: alkaline water and polymer electrolyte membrane electrolysis.

Green H₂ cost

Green H₂ is currently ~2 - 4 times more expensive than grey H₂, but it is expected that grey and green hydrogen will reach price parity by 2030 in areas with a RE cost advantage. Grey H₂ will be more expensive than green H₂ by 2050.

The cost of RE is a key driver of cost competitiveness of green H₂. SA is well placed to provide green H₂ powerfuels, within the 2020’s, below globally competitive price points.

Powerfuels production pathways

Green H₂ powerfuels will be most attractive to sectors which are difficult to decarbonise (e.g. most heavy industry, heavy duty & marine transport, fertilisers, aviation & chemicals longer term.)
SETTING THE SCENE – GREEN H2 AFRICA POTENTIAL ECONOMIC IMPACT

AFRICA 2050 EXPORT POTENTIAL

20-40 MT/ANNUM

EXPORT POTENTIAL BY PRODUCT

HYDROGEN 19MT
AMMONIA 9MT
METHENOL & SYN FUEL 13 MT

AFRICA 2050 DOMESTIC POTENTIAL

10-20 MT/ANNUM

DOMESTIC POTENTIAL BY PRODUCT

ROAD TRANSPORT 4.8MT
INDUSTRY 4.1MT
CHEMICALS & REFINING 3.4MT

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H₂ research in SA spans back to 2007, through Hydrogen South Africa (HySA) led by the Department of Science and Innovation (DSI). Prior work predominantly focused on H₂-powered fuel cell electric vehicles as an alternative to internal combustion engine vehicles. In September 2021, cabinet approved the extension of the Hydrogen Society Roadmap for the next 10 years.

‘Hard-to-abate’ sectors cannot be fully decarbonised through RE and direct electrification or through RE and battery storage. Green H₂ provides the best, long term, opportunity to decarbonise hard-to-abate sectors, as its use is free of emissions and provides the energy density and long-term storage capabilities needed.

Broadly three (3) commercialisation lanes drive SA’s green H₂ industrialisation. As per the estimates, green H₂ will initially sell at a price premium until economies of scale drive down the unit cost of RE in particular. Across the 3 commercialisation lanes, this initial price premium is better borne by the export market than the domestic market.

The largest single cost component for on-site production of green H₂ is the cost of the renewable electricity needed to power the electrolyser unit. This renders production of green H₂ more expensive than blue H₂, regardless of the cost of the electrolyser. A low cost of electricity is therefore a necessary condition for producing competitive green H₂. This creates an opportunity to produce H₂ at locations around the world that have optimal renewable resources, in order to achieve competitiveness.¹

Three commercialisation lanes for SA to drive industrialisation of green H₂, based on demand for powerfuels:

- **Local Industry & Grid**: Conversion of existing industries and grids to use green H₂ as a power source, particularly in sectors that will face drop-off in export demand if they do not decarbonise by 2030.

- **Mining & Transport**: Contributing platinum group metals and/or actively producing H₂ fuel cells and associated technologies, linked with the conversion of maritime, aviation and heavy vehicle fleets including buses and potentially minibus taxis.

- **Export**: Producing mass scale green H₂ and derivatives for export, with flow-over into domestic consumption.

Source: ¹ IRENA, 2020
SETTING THE SCENE – POTENTIAL EXPORT AND DOMESTIC DEMAND

**EXPORTS**
- SA could target to export 4-8 MT of H2 and derivatives by 2050
- Strong potential to capture 4%-8% of the ammonia export market with strong possibility in Japan and South Korea
- Strong potential to export value-added products like green steel and fertilizers (have a potential to be competitive against conventional technologies with a relatively low carbon price)

**SA DOMESTIC DEMAND**
- SA domestic demand could reach 2-5 MT by 2050

**UNDERLYING HYPOTHESIS**
- Ability to attract investors to build 3-5 GW of electrolyser capacity and 6-10 GW of dedicated renewable energy by 2030
- Securing early of-take agreements
- Strong bilateral ties with Japan, South Korea, Europe, China and India
- Deep pool of technical skills and funding
SETTING THE SCENE – SA POTENTIAL ECONOMIC IMPACT

- **RE CAPACITY**
  - 140-300 GIGAWATTS

- **MARKET OPPORTUNITY**
  - US$ 15-30 BN PER YEAR

- **CUMULATIVE INVESTMENT**
  - US$ 100 – 250

- **EMPLOYMENT POTENTIAL**
  - 1.4M JOBS
COUNTRY INVESTMENT STRATEGY

Big Frontier 1
Green Hydrogen

Big Frontier 2
Next Generation
Digital Industries and Infrastructure

Big Frontier 3
SEZ anchoring advanced manufacturing and logistics networks targeting export

Big Frontier 4
Industrial Cannabis and other advanced agro-processing

Big Frontier 5
Hyper-scaling Environmental, Social and Governance (ESG) or Impact Investing linked to social and green economy objectives
SASOL is one of the world’s largest grey H₂ manufacturers (~ 2.5 mill tpa) for internal and the domestic market. Sasol can leverage its expertise and infrastructure to enter the green H₂ market. This can be done through green field facilities e.g., Boegoebaai and the repurpose of its current infrastructure to produce green H₂ derived products like Sustainable Aviation Fuel from the Secunda complex and repurposing electrolysers at the Sasolburg complex to produce green H₂ for the domestic market from 2023 e.g., heavy duty mobility, green steel, auxiliary power and mining.

One of the first green H₂ lighthouse projects that will be developed in SA is the Boegoebaai green H₂ SEZ, adjacent to the planned Boegoebaai port in the north west corner of the NC. Sasol, who is leading the project, expects the Feasibility Study to take 24 months. The Boegoebaai green H₂ project has the potential to scale to a $10Bn investment bringing unprecedented economic growth and stimulating jobs in the NC Region. At full capacity, the Boegoebaai plant could drive the development of 10 GW of dedicated RE capacity and 5 GW of electrolyser capacity producing ~400 ktpa of H₂. The project is envisioned to utilise a 60/40 solar/wind supply. The Project could create up to 6 000 permanent jobs and more than 50 000 temporary jobs. Sasol will set up a consortium during feasibility to increase value and de-risk the project.

The HYDROGEN VALLEY PROJECT led by Anglo American Platinum will demonstrate the decarbonisation of heavy mining vehicles and heavy-duty transport from Mogalakwena in the Limpopo Province to eThekwini in the province of KwaZulu-Natal. Lessons learnt can be used to decarbonise the significant mining sector in the Northern Cape. Excess H₂ produced could enable the development of retail green H₂ infrastructure, which will be supported by the conversion of 50% of the Northern Cape’s provincial fleet from ICEs to FCEVs and BEVs by 2025.

The PRIESKA POWER RESERVE PROJECT is led by a 100% South African, black woman-owned entity and is one of the more mature green H₂ projects as it is post, pre-feasibility stage.

This project aims to produce 70,000 tons of green ammonia per year in its first phase. Construction of the first phase will commence by 2023. The second phase will increase the ammonia production capacity to ~ 900,000 tpa.

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Thank you