



# *Green Hydrogen Commercialisation*

A path towards industrialisation, decarbonisation and socioeconomic upliftment for South Africa

Date : 17 April 2024

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# Who we are

- South Africa's largest development finance institution.
- Builds industrial capacity to fuel the country's economic growth, by funding viable businesses.
- Focuses on priority economic sectors that offer the greatest potential to unlock job opportunities.
- Proactively identifies new industries and looks to grow existing pivotal sectors.



# The Opportunity presented by Green Hydrogen for South Africa

## Why it is critical for South Africa to develop the GH<sub>2</sub> industry

### Market driven commercialisation

Import Markets for GH<sub>2</sub> to 2050 will be the EU (2030: 20mtpa); Japan (2040: 12mtpa; South Korea (2050: 1.2 mtpa), the United Kingdom (2050: 0.7 mtpa).

### Industrialisation opportunities

Value chain impact across multiple industries – renewable energy, steel, petrochemicals, transport, manufacturing, mining, construction, agriculture

### Infrastructure build

GH<sub>2</sub> projects will serve as anchor demand to justify shared infra. investment, e.g., Boegoebaai port, accel. Northern Cape grid expansion, reskilling initiatives, etc

### Decarbonisation

GH<sub>2</sub> can decarbonize much more than RE alone by replacing fossil fuel inputs in industrial processes; Last mile decarbonisation in hard to abate sectors

## The GH<sub>2</sub> economy presents new economic, skills, employment and community opportunities for South Africa

### GDP Increase of R100-R250bn, 1-3%



GH<sub>2</sub> value chain can drive industrialisation of heavy manuf. (e.g., green steel), petrochem (e.g., SAF, green MeOH and other PtX) to drive economic growth

### 650,000 to 1m new jobs



GH<sub>2</sub> value chain drive long-term net job creation in new green, and preserve jobs in at-risk industries (e.g., heavy man, petrochem)

### BBBEE including community empowerment



Opportunity to empower previously disadvantaged people by taking ownership in new businesses and by providing new job opportunities. Communities can be empowered by shareholding in projects and by SMMEs contracting along the GH<sub>2</sub> value chain.

### Gender equality and social inclusion

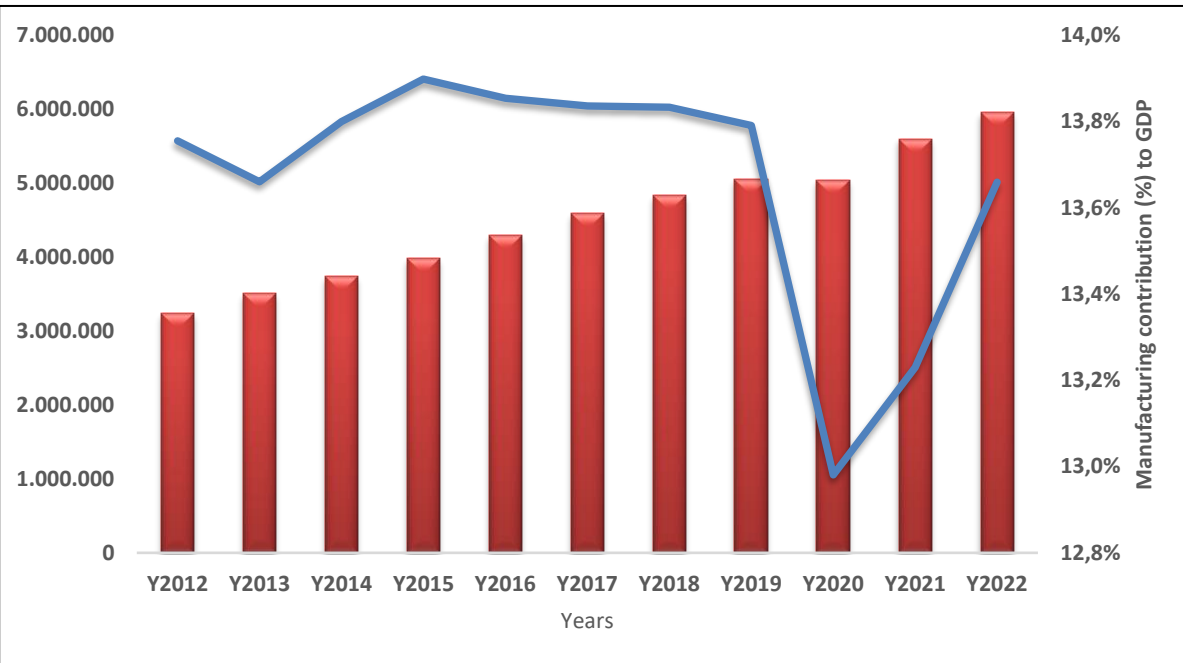


Opportunity to integrate gender equality through empowering women to take leadership roles in green industries as entrepreneurs and / or industry professionals



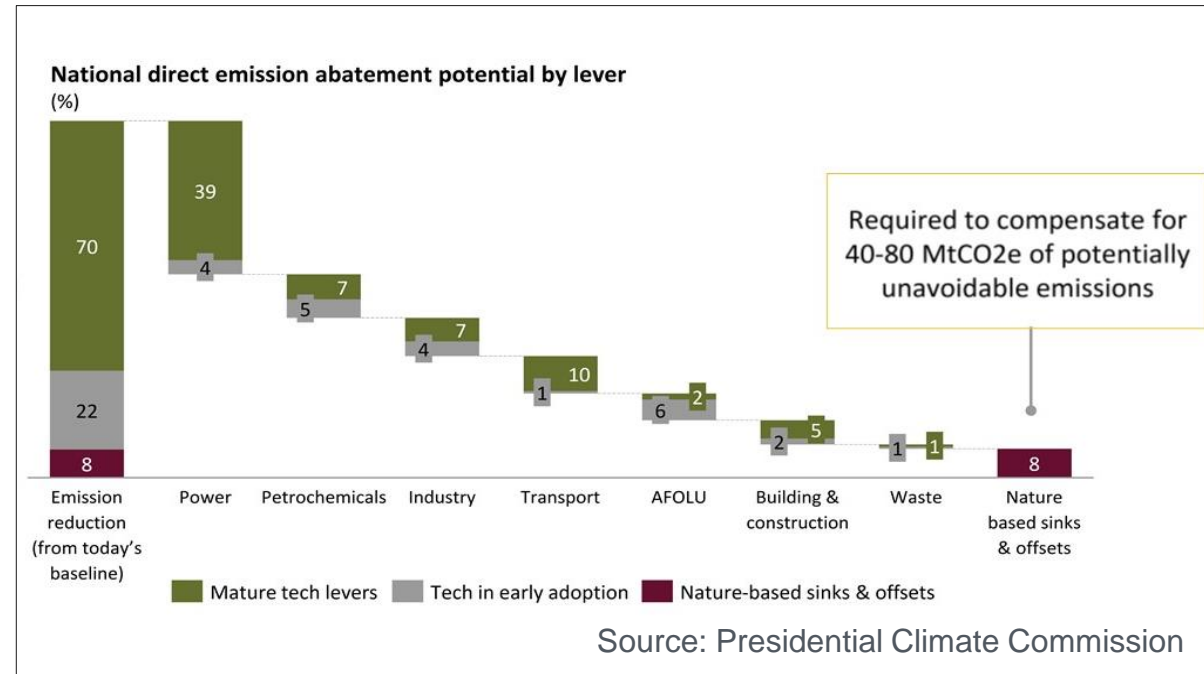
# The problem statement - premature de-industrialisation, decarbonisation within a just energy transition

Pre-mature deindustrialisation



Manufacturing contribution to GDP, 21% in 1994 and 13,9% in 2022 and has remained below 14% in the last 10 years

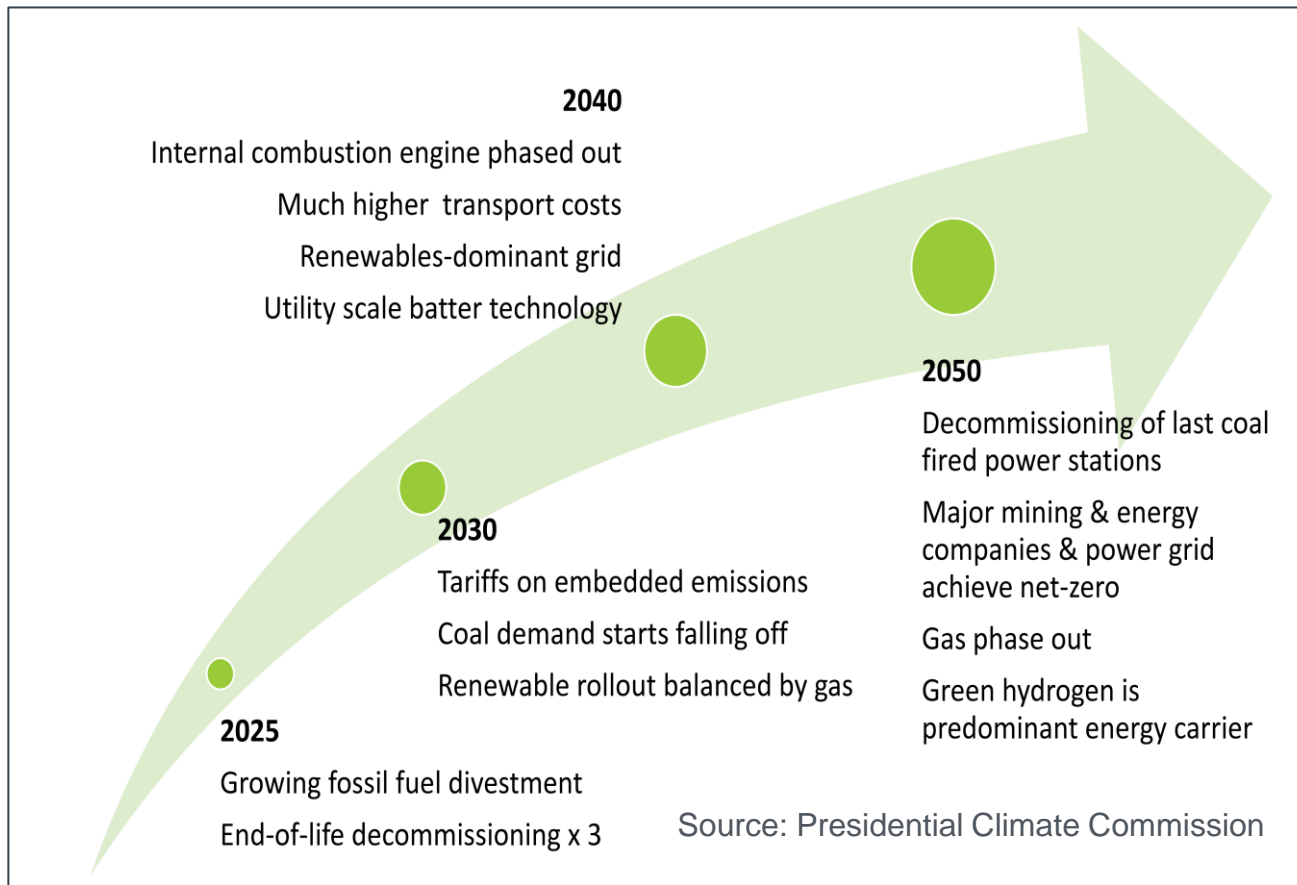
Decarbonisation



70% reduction by 2050 can be achieved via mature tech, last 30% depends on new tech, sinks & offsets

The GH<sub>2</sub> economy presents new economic, decarbonisation, skills, employment and community opportunities for South Africa...

# ...within a Just Energy Transition Pathway



**Just Energy Transition  
Implementation Plan  
2023-2027**

THE PRESIDENCY  
REPUBLIC OF SOUTH AFRICA

**GH<sub>2</sub> included in the JET-IP**



# 8 challenges must simultaneously be overcome for South Africa's GH<sub>2</sub> industry to materialise

Misconception that GH<sub>2</sub> is water intensive

Public awareness that projects are not water intensive; cost of water on GH<sub>2</sub> overall cost is minimal, leverage on desalination to provide water to communities

**Water requirements**

Cost of green products is at a premium compared to grey products

Utilise pricing subsidies to support export project business case

Target scale and learning rates will bring prices down successively

**Green Premium**

**Awareness**

Lack of understanding of the benefits and applications of GH<sub>2</sub>  
Awareness campaigns with NEDLAC, PCC, lobby groups ; JET-IP implementation plans will address knowledge sharing

**Energy Security**

GH<sub>2</sub> should not compete with energy crisis  
Projects will come on line after energy crisis resolved, projects will feed into the grid, community mini grid opportunities

**Policy Alignment**

Lack of inter-government and private sector policy alignment  
Expedite GHCS approval by Cabinet  
Execute implementation plans in GHCS and JET-IP targeting policy alignment

**Infrastructure Coordination**

Lack of coordination on infrastructure plans for ports, pipelines, road and rail  
TNPA coordinating ports work, pipeline study being initiated,

**Transportation costs**

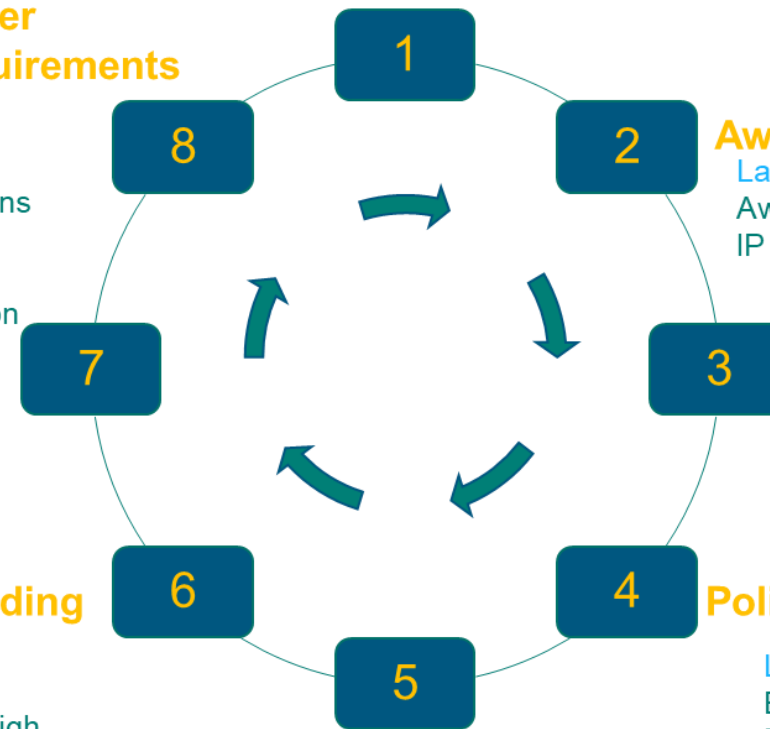
Transportation of GH<sub>2</sub> is very costly

GH<sub>2</sub> exports will be via conversion to ammonia; indications from SA commercial project pre-feasibility studies is that long distance transportation via ship is not a high cost  
Pipeline feasibility study for SA will provide more clarity on costs to transport hydrogen from the cost to inland via a hydrogen pipeline

**Funding**

Funders risk averse due to tech & offtake uncertainty

\$100m of grant funding being sourced to overcome high development risk

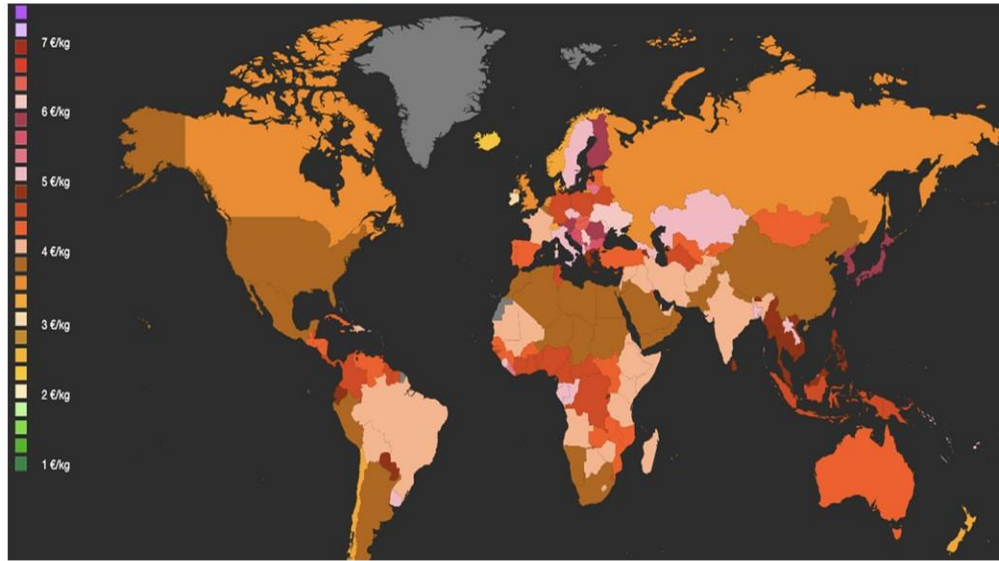


# South Africa's potential to be lowest cost producer

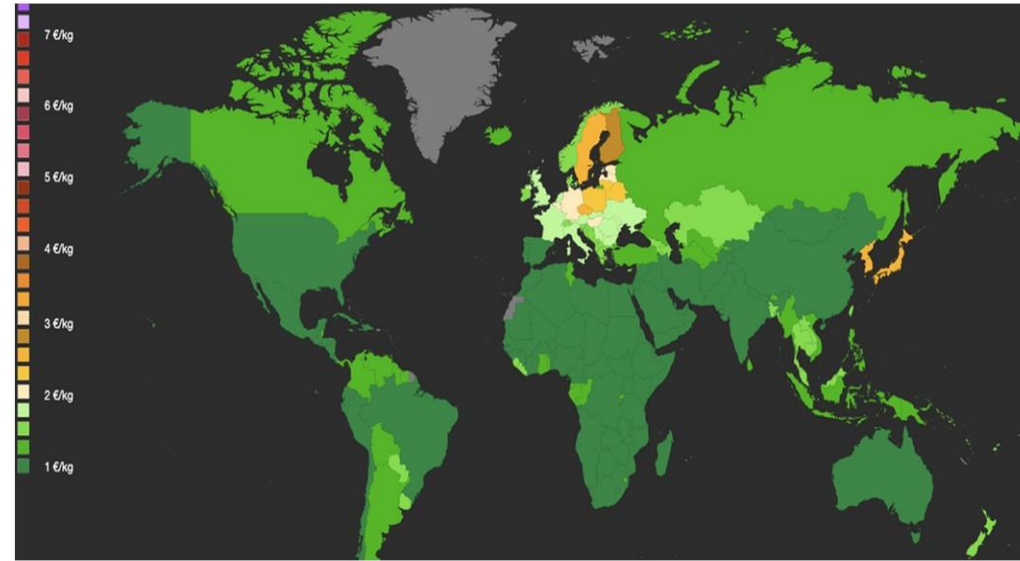
SA GH<sub>2</sub> could approach the \$1/kg GH<sub>2</sub> mark by 2050, equivalent to indigenous low cost energy, making South Africa one of the competitive industrial economies, however South Africa will differentiate itself by using proprietary Fisher Tropsch technology to target export of sustainable aviation fuel and will manufacture electrolyzers and fuel cells using PGMs available locally

## Levelised Cost of Hydrogen (LCOH) comparable with the lowest cost producers in the world

Global Green Hydrogen Pricing - 2025\*



Global Green Hydrogen Pricing - 2050\*

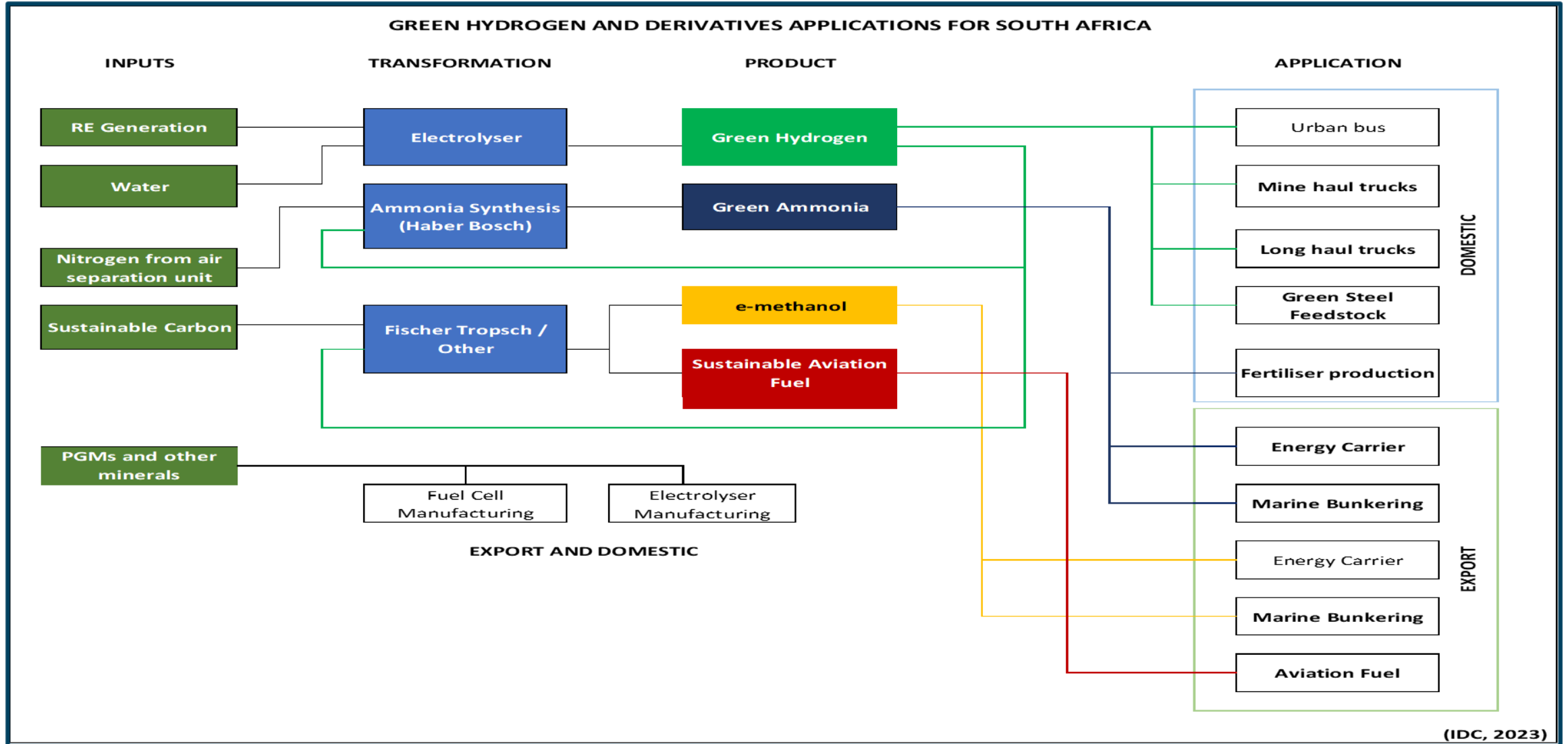


\*PwC research (2021) | based on an analysis of various renewable energy sources and electricity generation / hydrogen equipment cost reductions worldwide

- Although far from the GH<sub>2</sub> importing markets in Europe and Asia, South Africa has the potential to make up the cost differential through greater efficiency and government support programmes.
- In 2025, the initial focus will be on the export of GH<sub>2</sub> at competitive prices as domestic use will not have reached commercial parity with local fuels. As GH<sub>2</sub> prices decline, a broader domestic transition will unfold.



# The Green Hydrogen Value Chain for South Africa

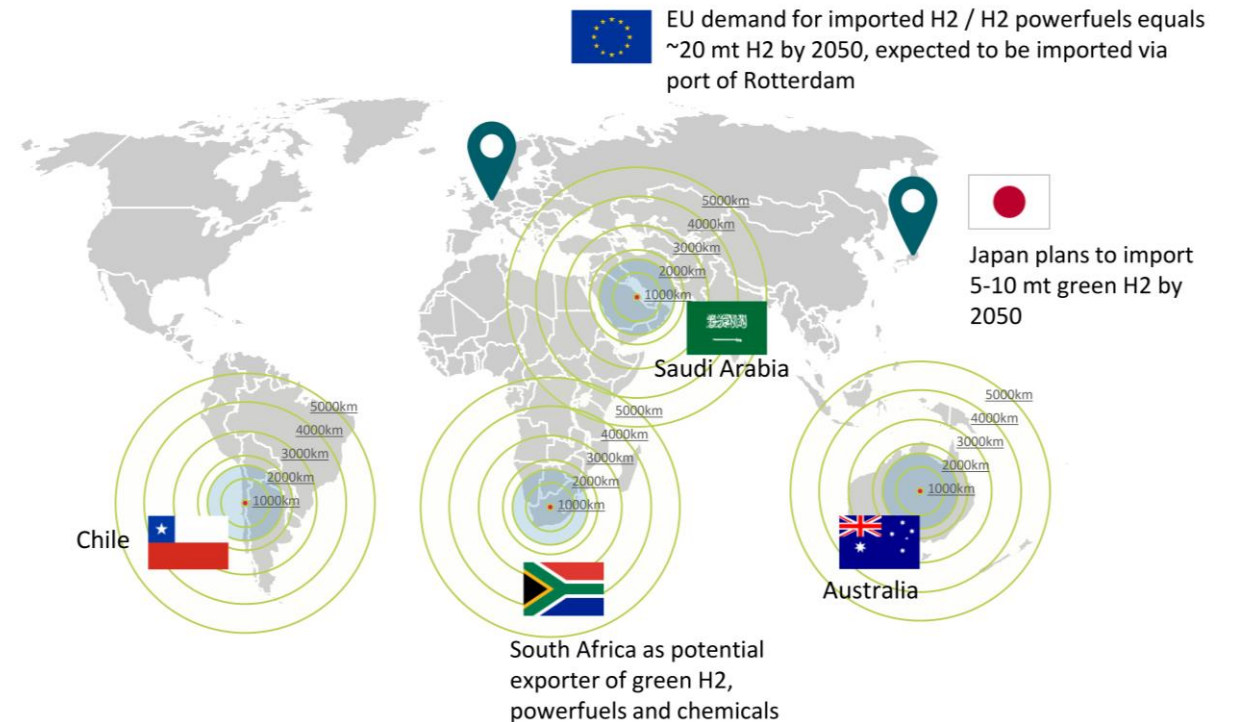




# Targeted Export Market

Significant additional GH<sub>2</sub> demand could arise from supply of GH<sub>2</sub> products to Europe and Japan where imports of 25-30mt GH<sub>2</sub> is expected by 2050

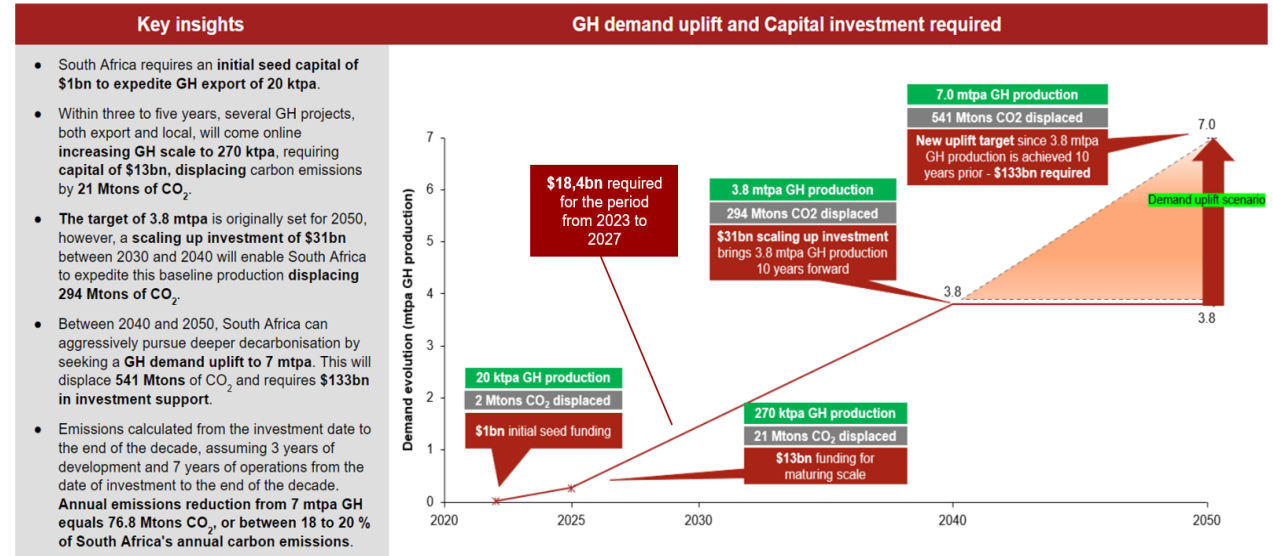
- **Import Markets** for GH<sub>2</sub> to 2050 will be the European Union (2050: 11-15 Mt GHpa); Japan (2050: 5 to 10 Mt GHpa); South Korea (2050: 1.0 to 1.2 Mt GHpa) and the United Kingdom (2050: 0.5 to 0.7 Mt GHpa).
- **Export Potential:** South Africa is well positioned for global exports with estimates of the potential ranging between 1.9 to 8.0 Mt GHpa. Positioning on the Indian and Atlantic shipping routes could enable 8-10% market share of the global ammonia / methanol fuels market for shipping, equivalent to a further 0.8 to 1.0 Mt per year of GH<sub>2</sub>.



# 3,8 to 7 mtpa by 2050 will need ~ \$164 - \$300 bn investment

- \$1bn investment could expedite GH<sub>2</sub> export of 20 ktpa.
- Within three to five years, several GH<sub>2</sub> projects, both export and local, will come online increasing GH<sub>2</sub> scale to 270 ktpa, requiring capital of \$13bn, displacing carbon emissions by 21 Mtons of CO<sub>2</sub>.
- The target of 3.8 mtpa by 2040 will require total investment of \$164 bn by 2040.
- Between 2040 and 2050, South Africa can aggressively pursue deeper decarbonisation by seeking a GH<sub>2</sub> demand uplift to 7 mtpa. This will displace 541 Mtons of CO<sub>2</sub> and increase investment support to \$133bn.
- Emissions calculated from the investment date to the end of the decade (assuming 3 years of development and 7 years of operations) could result in annual emissions reduction of between 18 to 20 % of South Africa's annual carbon emissions.

## GH<sub>2</sub> demand uplift and Capital investment required



## PRODUCTION TARGETS

YEAR	2025	2030	2040	2050
TARGET	20	270	3.8	7
UNITS	ktpa	ktpa	mtpa	mtpa



# South Africa's approach is anchored on 6 elements

The successful implementation of the commercialisation strategy will depend on the execution of the six key elements :

<b>1</b> <b>TARGET EXPORTS</b> Target exports of green hydrogen and green chemicals by leveraging on South Africa's proprietary Fischer Tropsch technology and utilising financing support mechanisms including grants, concessional debt and contract for difference/price subsidies to improve the financial viability of these projects	<b>2</b> <b>STIMULATE DOMESTIC MARKET</b> In parallel to the export strategy, develop projects along the value chain to stimulate demand for green hydrogen in South Africa. "Low hanging fruit" opportunities to be prioritised to provide confidence in the domestic market. Examples include green steel, fertiliser, hydrogen valley mobility programme and sustainable aviation fuel projects.	<b>3</b> <b>SUPPORT LOCALISATION</b> Develop local industrial capability to produce fuel cells, electrolyser, ammonia cracking and balance of plant equipment and components by leveraging on South Africa's PGM resources. Together with demand stimulation this will drive longer term GH <sub>2</sub> price reduction allowing penetration in various sectors.	<b>4</b> <b>SECURE FINANCING</b> "Crowd in" and secure funding from various sources and in various forms including grants, concessional debt and contract for differences.	<b>5</b> <b>PROACTIVE SOCIO ECONOMIC DEVELOPMENT</b> Maximise development impact (incl. skills and economic development and social inclusion). Ensure gender equality, BBBEE and community participation. Maximise job creation and alternative options for potential job losses.
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## **6** **ROLE OF GOVERNMENT IN POLICY AND REGULATORY SUPPORT**

Position GH<sub>2</sub> as a key early contributor to decarbonization and a just transition in the country programme of work being collated by the JET-IP Task Team ensuring a fair proportion of climate finance is sourced to enable development of this industry.

Prioritize the execution of the green hydrogen commercialisation strategy and the development of a national GH<sub>2</sub> infrastructure plan

Drive the required policy and regulatory changes required to sustain long term growth of the new hydrogen industry.

Mobilise and coordinate the Government support required to support the development of this new industry for South Africa.



# Showcasing projects status – Government Gazette List

In December 2022, Minister of Public Works and Infrastructure, gazetted the nine projects that have received Strategic Integrated Projects and are progressing well

No.	Project	Status
1	HySHiFT, sustainable aviation fuel production in Secunda	Successfully progressed to next phase of the H2 Global bidding process
2	Prieska Energy Cluster green ammonia production in the Northern Cape	Feasibility study in progress (2025 commission date)
3	Boegoebaai GH <sub>2</sub> Port in the Northern Cape	Master planning completed and 3 potential port developers announced; Sasol appointed Mizhuo as financial advisor
4	Ubuntu GH <sub>2</sub> Project in the Northern Cape	Pre-feasibility study completed
5	Atlantia Green Hydrogen production at Saldhana Bay	Pre-feasibility conducted
6	Upilanga Solar and Green Hydrogen Park in Northern Cape	Bankable Feasibility Study in progress
7	Sasolburg Green Hydrogen Programme in the Free State	Successful production of green hydrogen
8	Hive energy Green Ammonia in Eastern Cape	Pre-feasibility study completed
9	Hydrogen Valley Programme - Limpopo, KZN and Gauteng corridors	Various stages of feasibility, Rhyndow project completed pre-feasibility study





# Showcasing projects status – Government Gazette List

Additionally, 11 potential SIP projects were also in the Gazette which are progressing in the pre-feasibility phase

No.	Project
1	Mainstream RE GH <sub>2</sub> Project in the Western Cape – supply GH <sub>2</sub> to Saldhana Steel
2	AMSA Saldhana Green Steel – pre-feasibility funded by IDC
3	Enertrag Postmasburg Project – Ammonia in the NC
4	HDF Energy GH <sub>2</sub> for grid stabilisation in Mpumalanga
5	Enertrag Indigen – e-methanol in the Eastern Cape
6	Isondo FC MEA Manufacturing in Gauteng
7	Isondo / NCP Waste Hydrogen Recovery
8	Saldhana Bay Green Hydrogen Project
9	Project Phoenix FC manufacturing
10	Cape Stack in the Western Cape
11	Bambili Hyplat FC Manufacturing



# Showcasing projects (1/2)

## Green Ammonia Production for export



### HIVE COEGA GREEN AMMONIA PROJECT

Hive Energy and Built Africa are developing a \$4.6bn Green Ammonia Plant. The plant will have a dedicated power supply at the Coega Special Economic Zone, alongside the Port of Ngqura. The plant will produce approximately 780,000 tons per year of green ammonia for the export market. This project is working together with Cerebos in a mutually beneficial way, which entails Cerebos providing the project with desalinated, demineralized water while the project will supply green energy to Cerebos

## Fuel Cell Manufacturing



### PROJECT PHOENIX

Mitochondria Energy is planning to build a hydrogen fuel cell manufacturing facility in the Vaal Special Economic Zone (SEZ) in partnership with the IDC, DTIC and DBSA. Mitochondria's plans involve developing manufacturing capacity to build units totaling 250 MW a year, with plans to eventually ramp up to 1 000 MW a year, dependent on demand at the time.



# Showcasing projects (2/2)

## Green Steel Production



### SALDHANA GREEN STEEL PRODUCTION

ArcelorMittal South Africa (AMSA) is investigating the viability of restarting the Saldhana Bay operations to produce green steel with green hydrogen. AMSA plans to be the first African green flat steel producer using green hydrogen by producing direct reduced iron (DRI) via the Midrex facility at its Saldanha Works

## Sustainable Aviation Fuel

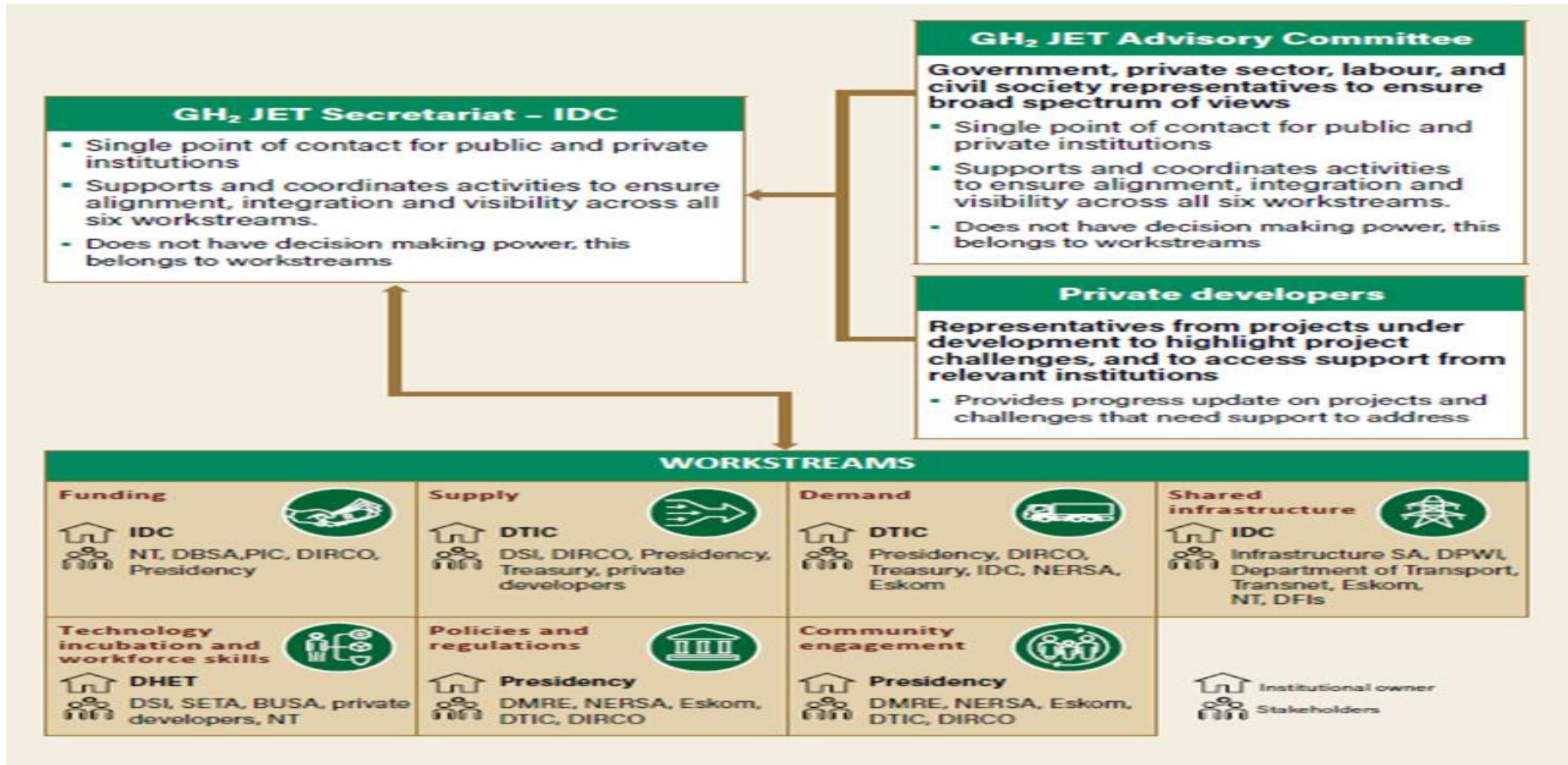


### HYSHIFT SUSTAINABLE AVIATION FUEL IN SECUNDA

Sasol as part of a consortium known as HyShiFT, is developing a sustainable aviation fuel (SAF) project in Secunda. Other partners in the consortium include German-based renewable energy company Enertrag and chemicals company Linde and South African company Hydregen. The project entails using green hydrogen and sustainable carbon to produce SAF for the export market.



# GH2 JET-IP Governance and Institutional Arrangements





# Key Messages – GHCS

Commercialisation of the GH<sub>2</sub> industry provides a pathway for re-industrialisation, decarbonisation and social upliftment

1

## SA Unique Value Proposition

South Africa is well positioned to produce GH<sub>2</sub> thanks to our structural competitive advantages – best in the world **renewable energy resources**, unique expertise in **Proprietary Fischer-Tropsch technology** for beneficiation into **e-fuels** and endowment of **PGMs**

2

## Export and local demand opportunity

Opportunity to develop local demand opportunities in **steel, fertilizer, aviation fuel and transport** applications while **expediting** export of **ammonia, methanol and bunker fuel** to capture the global market

3

## Water and energy security

Oversize **desalination** facilities to provide **water to communities** with minimal impact on the GH<sub>2</sub> price  
Supply of **excess electricity** into the grid and supporting **transmission infrastructure**  
investment to enable other **RE projects** to feed into the grid

4

## Industrialisation and local manufacturing

Economies of scale demand for equipment along the value chain will provide business case for local **manufacture of RE components, fuel cells, electrolyser and balance of plant components** supporting **reindustrialization** of the SA economy

5

## Decarbonisation

Decarbonisation of **hard to abate** sectors initially funded by export projects - with **progressive decrease in GH<sub>2</sub> prices** will allow penetration and **decarbonisation into multiple sectors** further supporting **reindustrialization**

Need to be action plan driven, move with speed and address the enablers namely national coordination, policy, regulations, funding, skills development and proactive socio-economic development



*Thank you*



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We consider ourselves a fundamental solution to driving economic development and look forward to working with you in growing our economy and developing Africa.

