



NGHRI

Namibia Green Hydrogen Research Institute

<https://www.nghri.com/>



Maximising GH₂ benefits for the local market

Dr. Zivayi Chiguvare (Chairperson)

Namibia Private Sector

GH₂

Task Force

Namibia Green Hydrogen Conference 2022

... large industrial groups, SMEs, start-ups, laboratories and R&D centers, clusters and territorial authorities, etc.

- Hydrogen can be produced from diverse, domestic resources
- Electricity—from the grid or from renewable sources such as biomass, geothermal, solar, or wind—can be used to produce hydrogen.
- Electrolysis separates the H₂O molecule into oxygen and hydrogen
- Hydrogen is an energy carrier, not an energy source, and can deliver or store a large amount of energy
- Hydrogen is a clean fuel that, when consumed in a fuel cell, produces only water, electricity, and heat



broad range of applications —transportation, commercial, industrial, residential, and portable (distributed or combined-heat-and-power; backup power; systems for storing and enabling renewable energy; portable power; auxiliary power for trucks, aircraft, rail, and ships; specialty vehicles such as forklifts; and passenger and freight vehicles including cars, trucks, and buses)



- Hydrogen can be produced from diverse, domestic resources

... .. HYDROGEN	PRODUCTION METHOD
Green	Generated using electrolysis powered by renewable electricity
Blue	Production is based on fossil fuels but with CO ₂ emissions captured
Gray	Made using fossil gas with no emissions captured
Black	Made using coal
Brown	Made using lignite
Turquoise	Heat is used to split fossil gas in a process known as "pyrolysis"
Purple, pink or yellow	Electricity and heat from nuclear reactors could both be used to produce hydrogen

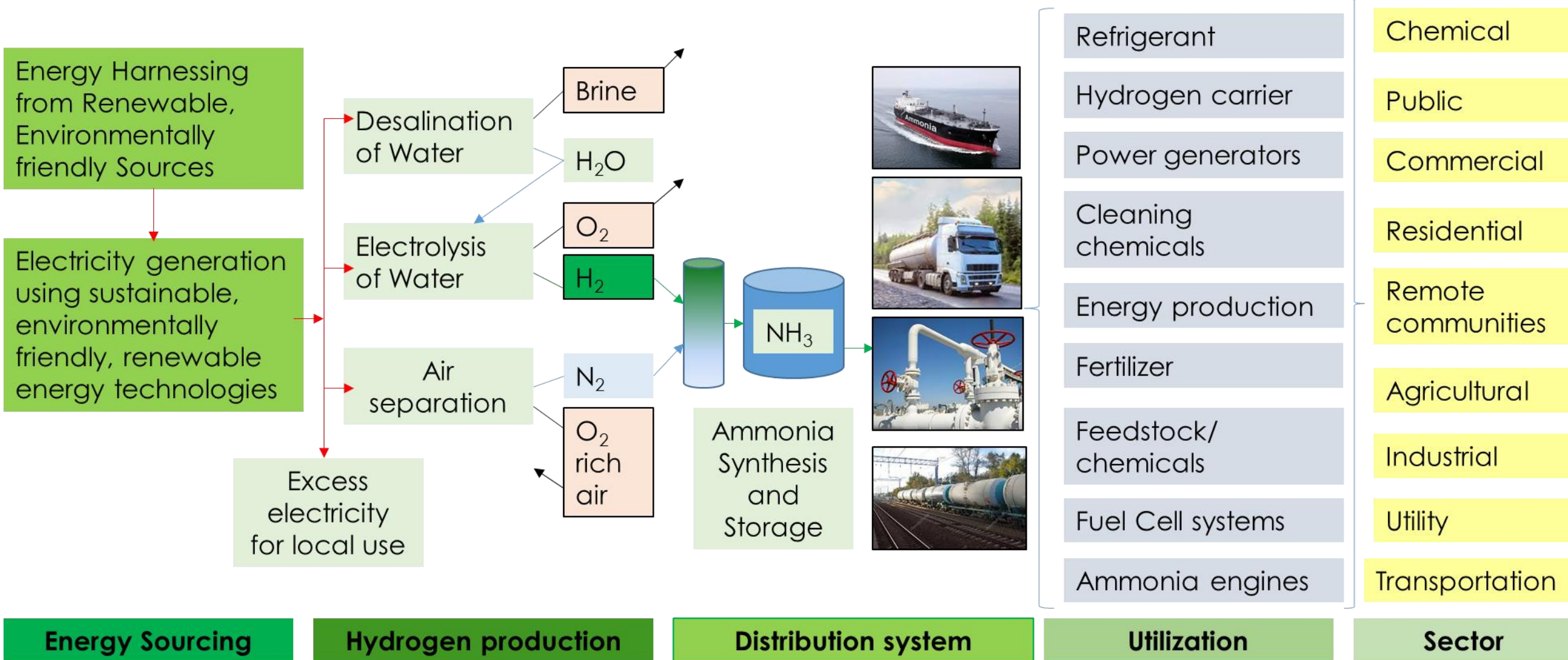
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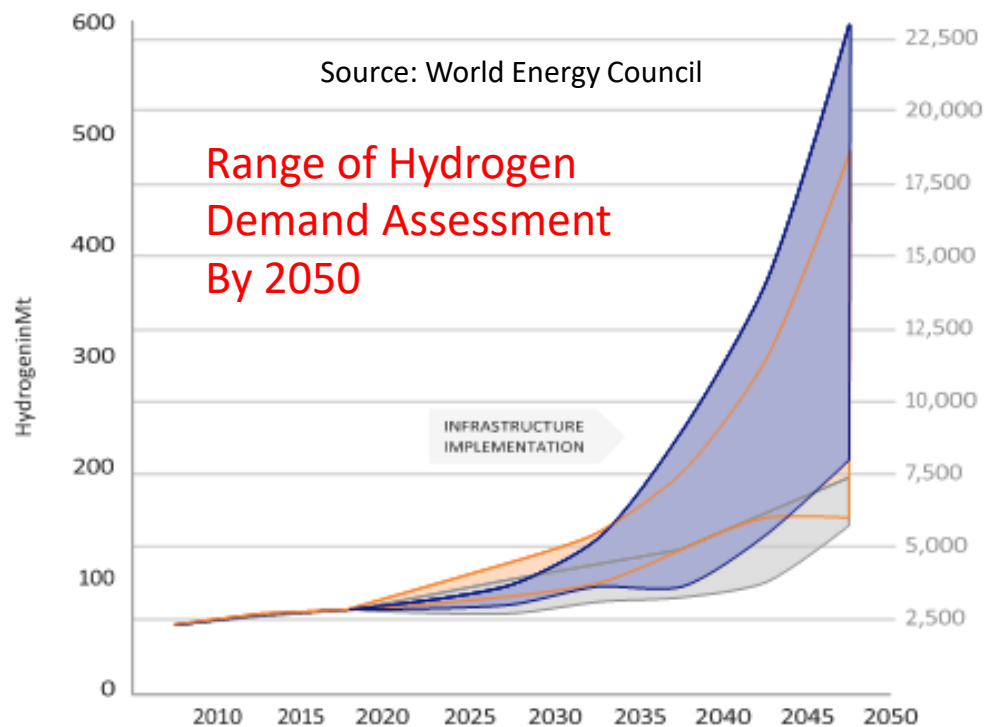
... drive Namibia's private sector involvement in, and beneficitation from, the Green Hydrogen industry

Green Hydrogen energy system

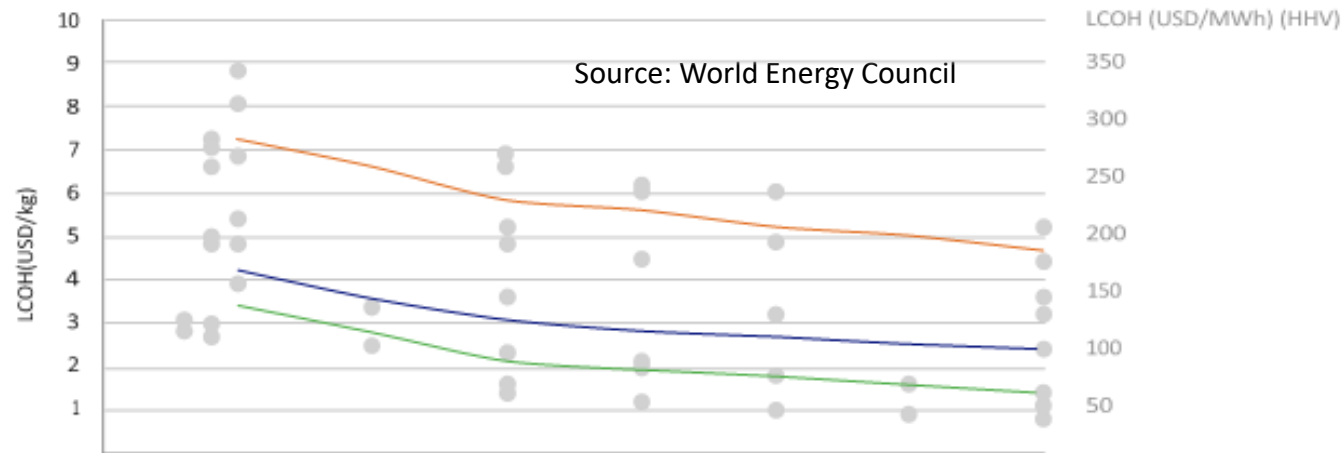


Local opportunities? Raw material sourcing... Production ... Storage ... Transport ... Utilization (must be economically, and environmentally, viable and safe)

- Hydrogen demand is expected to increase rapidly



- Hydrogen costs are expected to drop commensurately



Renewable Hydrogen Cost Dynamics By 2050

● < 1.8°C

Acil Allen Report - High
BP Energy Outlook 2020 - Net Zero
IEA Energy Technology Perspectives 2020 - SDS
Shell - Sky Scenario
Powerfuels in a Renewables World
Hydrogen Economy Outlook - Strong Policy

● 1.8 - 2.3°C

Acil Allen Report - Medium
BP Energy Outlook 2020 - Rapid
Hydrogen Council - 2DS
World Energy Council - Unfinished Symphony

● > 2.3°C

Acil Allen Report - Low
World Energy Council - Modern Jazz
Hydrogen Economy Outlook - Weak Policy

- Hydrogen as large scale energy storage can enable higher penetration of intermittent renewables

[chrome-extension://efaidnbmninnipocajpcgclefindmkaj/https://www.worldenergy.org/assets/downloads/Working_Paper_-_Hydrogen_Demand_And_Cost_Dynamics_-_September_2021.pdf](https://www.worldenergy.org/assets/downloads/Working_Paper_-_Hydrogen_Demand_And_Cost_Dynamics_-_September_2021.pdf)

Executive Committee Namibia Private Sector Green Hydrogen Task Force

GH₂ Value Chain Opportunities

- Namibia Petroleum Operators Association
- Chamber of Mines of Namibia
- Federation of Namibian Tourism Associations
- Namibia Logistics Association
- Impact Tank
- NCCI

Namibian Business Promotion

- StartUp Namibia
- Namibia Association for Metal Fabrication
- Namibia Travel & Tourism Forum
- Launch Namibia
- Glowdom
- Namibia Institute of Manufacturing and Commerce
- NCCI
- NamGHA

Regulatory Framework Review

- HDF Energy
- Women in Mining Association of Namibia
- Fuel and Franchise Association
- NamGHA

Stakeholder Engagement

- National Agricultural Business Association of Namibia
- Hospitality Association of Namibia
- Black Business Leaders Association
- Institute of Chartered Accountants of Namibia
- NCCI
- NamGHA

Research & Development

- Namibian Society of Engineers
- United Entrepreneurs Association of Namibia
- Namibia Chamber of Commerce and Industry (NCCI)
- Namibia Green Hydrogen Association (GHA)

... drive Namibia's private sector involvement in, and beneficiation from, the Green Hydrogen industry

Namibia Green Hydrogen Research Institute (NGHRI)

Centre for
clean
Hydrogen
Production

Centre for
Hydrogen
Storage,
New
Materials,
and Delivery

Centre for
Hydrogen
Fuel Cell
Technology,
and Mobility
Applications

Centre for
Hydrogen
Energy Use,
Economics,
Law,
Environment
and Society

Centre for
Hydrogen
Capacity
Building,
Competence,
and
Standards

Centre for
Hydrogen
Digital and
Emerging
Technologies

Formulation of enabling policies, end use and environmental sustainability options for
widespread hydrogen energy usage

Collaboration with government and private sector partners, International academic and research institutes,
identified as key for success

Namibia has a part to play in the world, for production and distribution of Green Hydrogen

Some identified projects

1	GREEN HYDROGEN PRODUCTION TECHNOLOGIES AND THE HYDROGEN VALUE CHAIN
2	SEAWATER DESALINATION
3	SOLAR AND WIND POWER (for desalination of sea water)
4	ELECTROCHEMICAL WATER SPLITTING FOR HYDROGEN GENERATION (WATER ELECTROLYSIS)
5	CATALYSIS: ROUTE TOWARDS GREEN HYDROGEN
6	DEVELOPMENT OF HYDROGEN FUEL CELLS
7	COMBINING HYDROGEN STORAGE, AMMONIA AND LIQUID HYDROGEN ORGANIC CARRIER
8	NEW MATERIALS DEVELOPMENT
9	PHOTOVOLTAIC AND WIND ELECTRICITY GENERATION AND STORAGE IN HYDROGEN
10	WATER RESOURCE MANAGEMENT
11	REGULATORY FRAMEWORK, POLICY FORMULATION AND ETHICS
12	STRATEGIC ENVIRONMENTAL ASSESSMENT, AND ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS
13	SKILLING, RESKILLING AND UPSKILLING THE WORKFORCE FOR A GREEN HYDROGEN FUTURE
14	EMERGING TECHNOLOGIES AND DIGITAL SOLUTIONS

Namibia has a part to play in the world, for production and distribution of Green Hydrogen

- NGHRI has partnered with multiple international universities, research institutes and companies for collaboration on Green Hydrogen.
- Partnerships are operationalized through R&D collaborations, placement of students, academic programme development and offerings, and pilot projects.
- Since January 2022, the Institute has hosted a number of international researchers including academics and postgraduate students pursuing diverse research projects.
- Academic programmes and courses are undergoing development and revision
- We will ensure that identified research projects and pilot projects on green hydrogen production and usage are properly implemented.
- We will also ensure that opportunities for participation are extended to the larger Namibian population.

Namibia Private Sector

GH₂
Task Force



THANK YOU