Geopolitics of hydrogen development in Africa – the case of Namibia

Chigozie Nweke-Eze

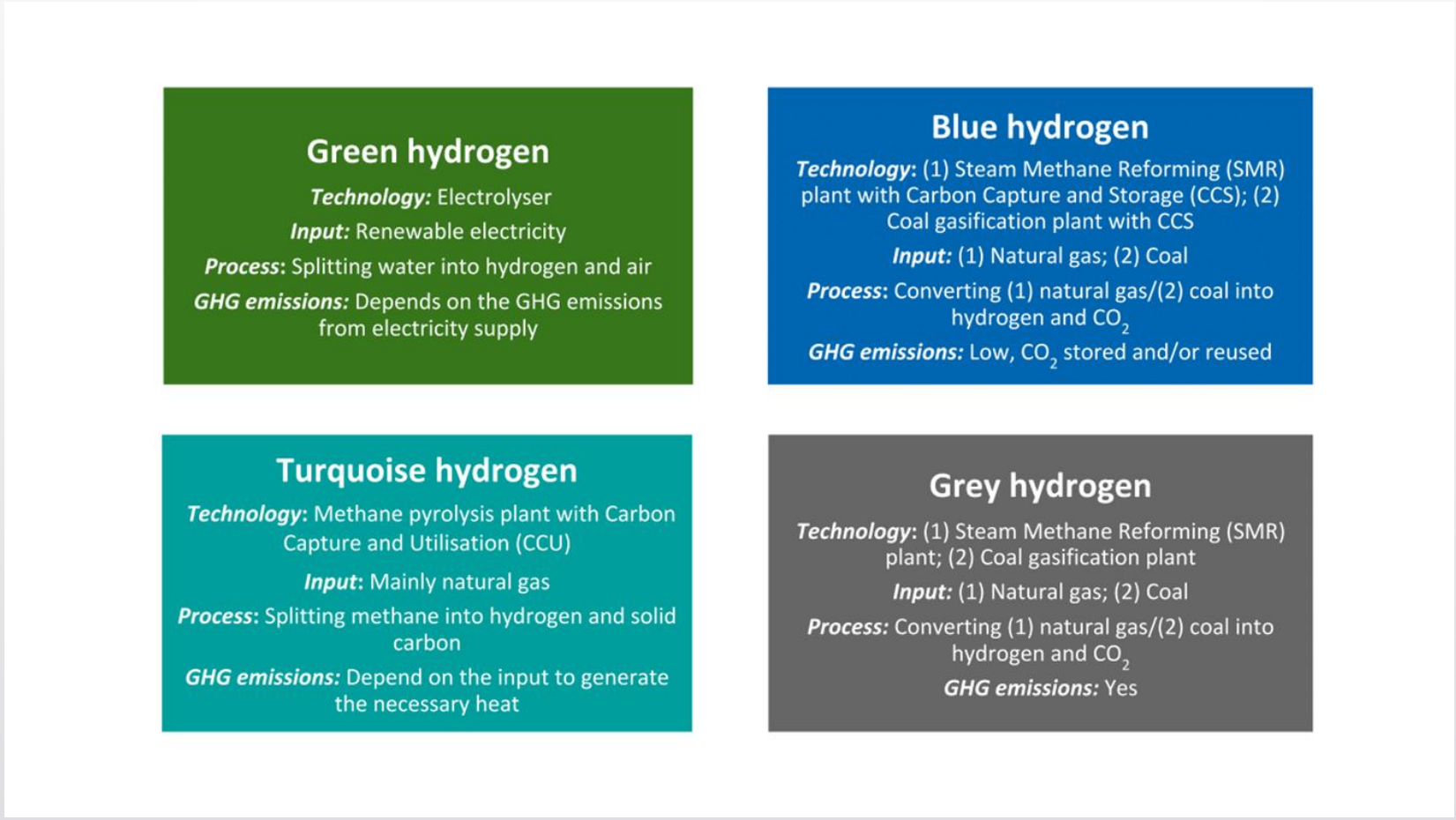
Founder, **Integrated Africa Power (IAP),** Bonn Germany

Former Research lead, Africa Hydrogen, IASS Potsdam Germany

cne@intafripower.de

+4915218672741

Forms of Hydrogen

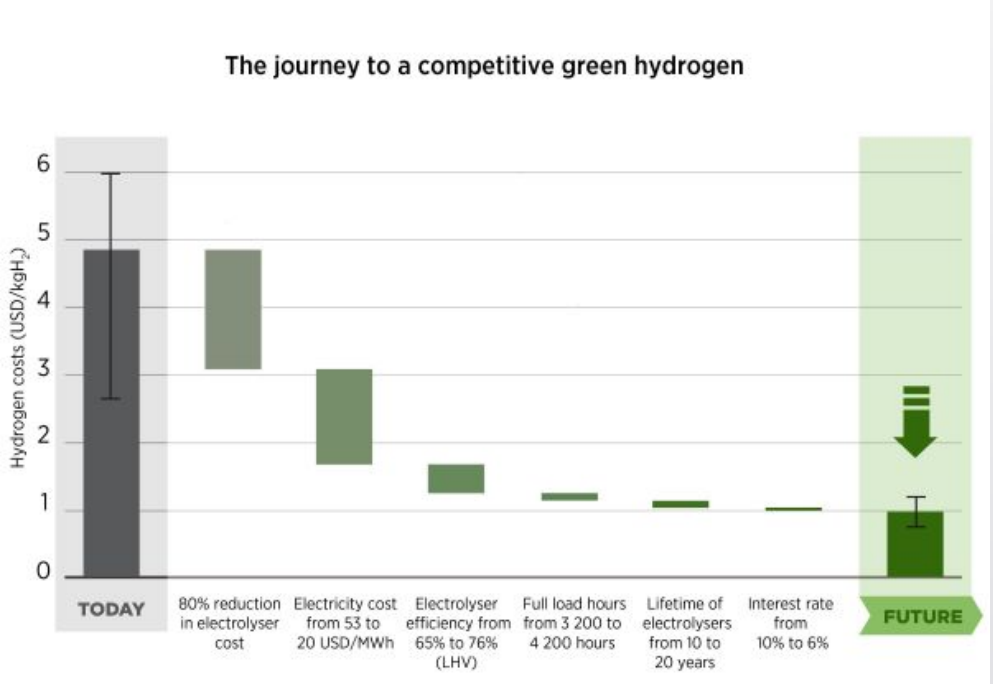


Applications and Utilization

- Today, hydrogen is used mostly in oil refining and for the production of fertilisers.
- For significant contribution to clean energy transitions, it also needs to be adopted in industries, transport and power generation sectors
- Continuing debate on “blue” vs “green” hydrogen
  - Cost and scale factors
  - Energy poverty, equity and justice
  - Logics for “blue” then “green” hydrogen

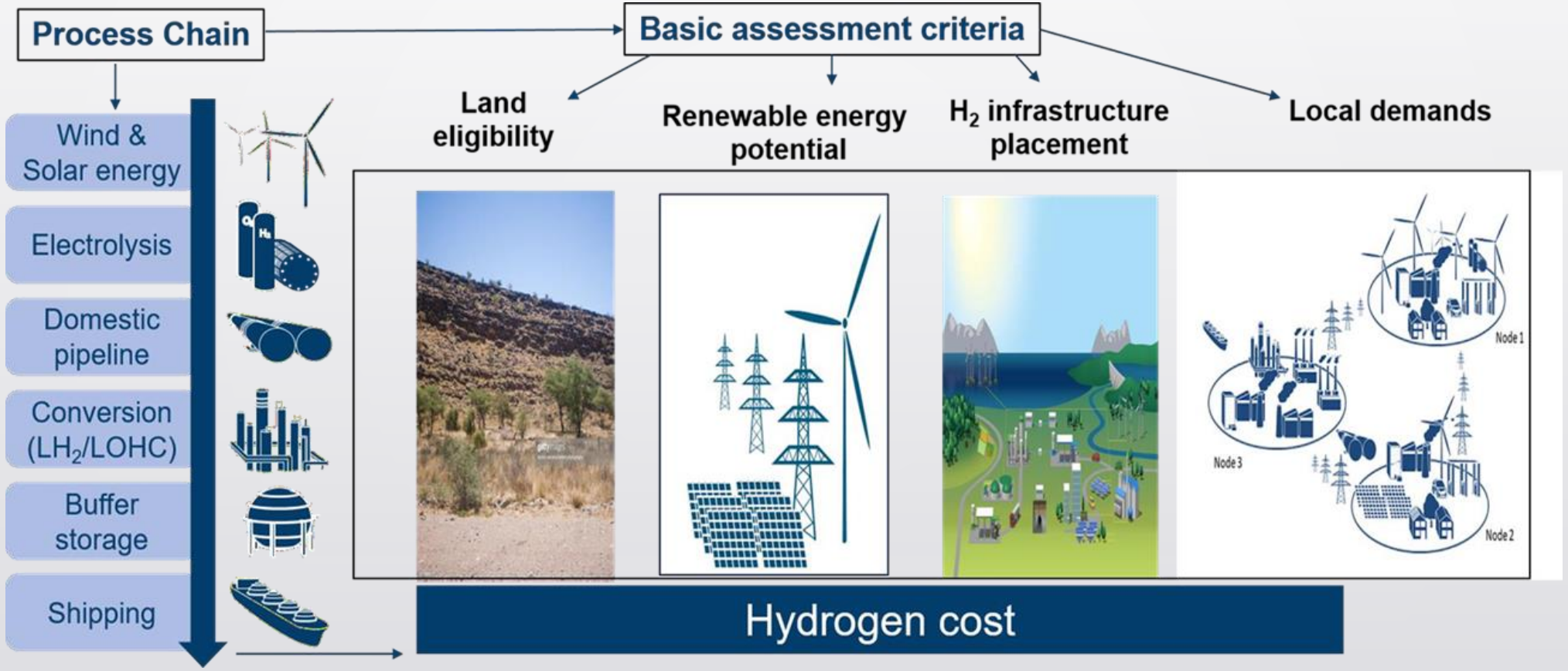
Current high cost of electrolysis, but falling in all markets

- Electrolysis prohibitively costly at low utilization.
- Green hydrogen from electrolysis struggles to be cost-competitive with other hydrogen production routes
- Importance of regulation that enables the monetization of potential CO2 benefits
- Currently, direct electrification with Renewable energies likely to be preferred wherever feasible



IRENA 2020)

Green Hydrogen process value chain and criteria



High and low priority of hydrogen applications

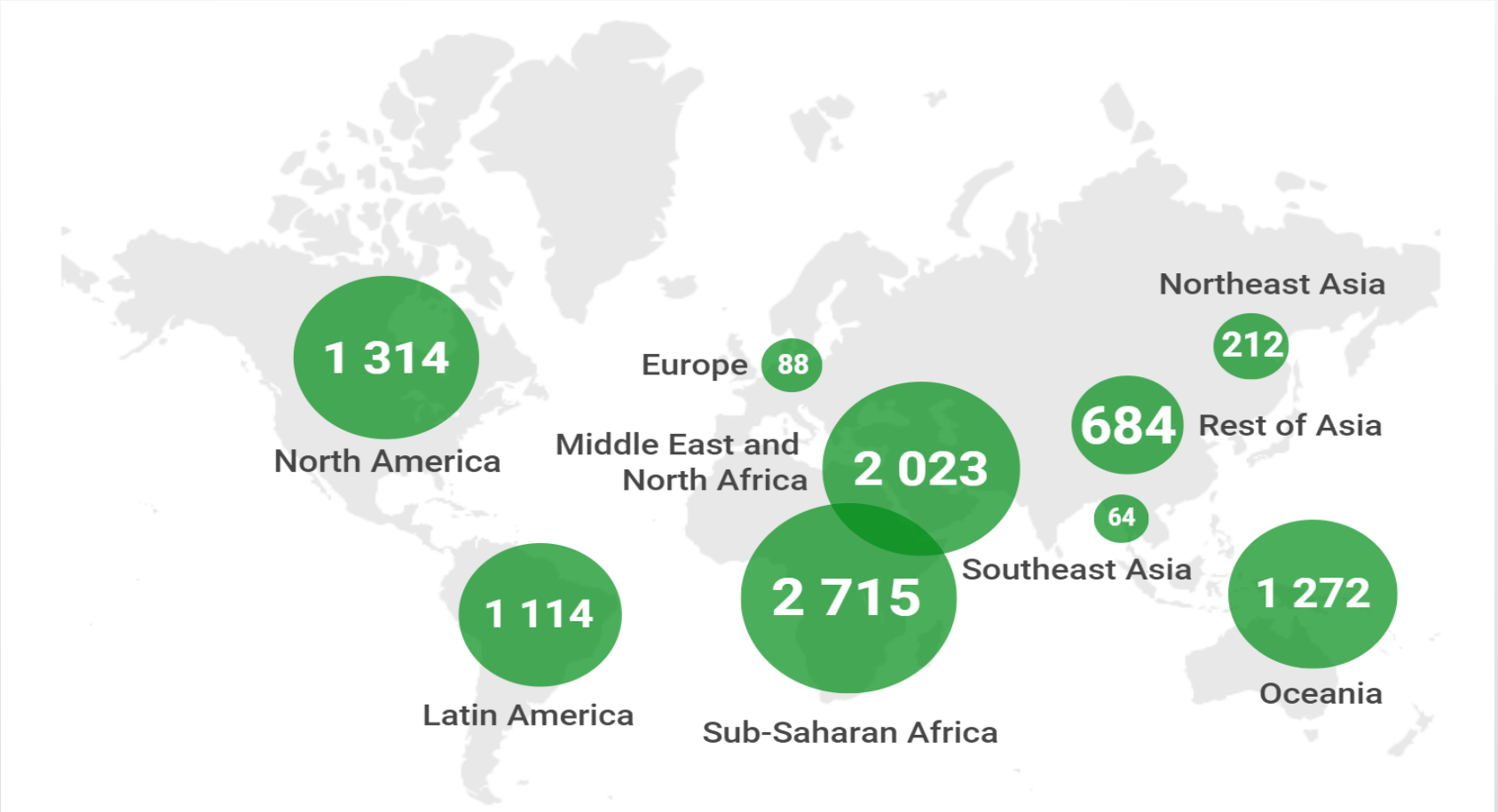
High priority Applications

- Decarbonize existing hydrogen demand – refining ammonia
- New industrial applications – especially steel making
- **Production of Methanol and Jet fuels**
- Use for balancing power with intermittent renewables.
- International marine transport
- Synthetic Liquid Fuels

Low priority Applications

- Road and rail transport (increasing competition with battery electric vehicles).
- Blending with natural gas (limited help for decarbonization, end user challenges)
- Distribution for residential heating (Technical challenges, Electric heat pumps more promising route to decarbonization)

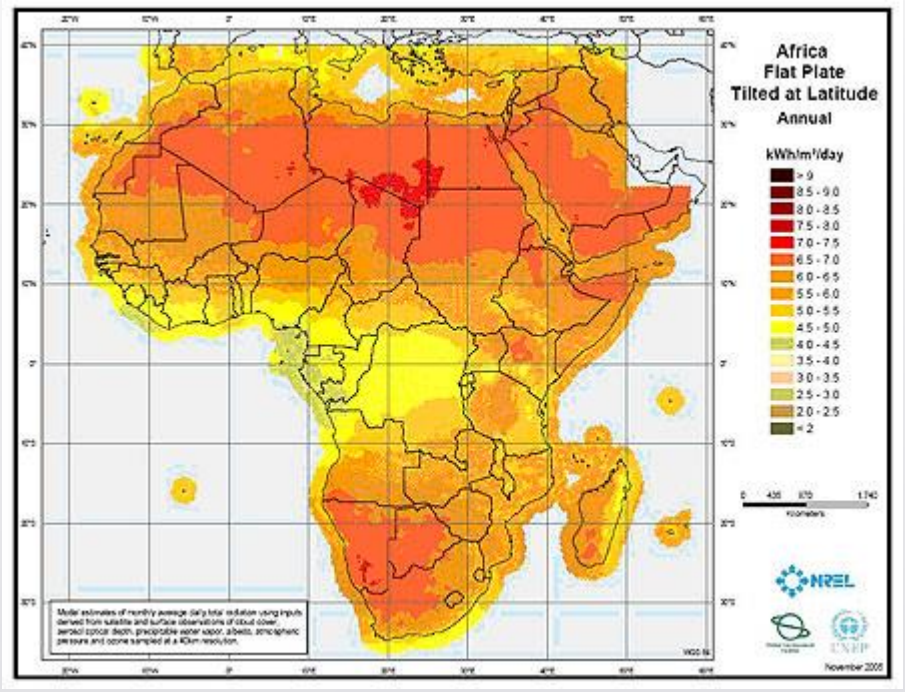
Low-carbon hydrogen potentials across regions



IRENA, ,,2021

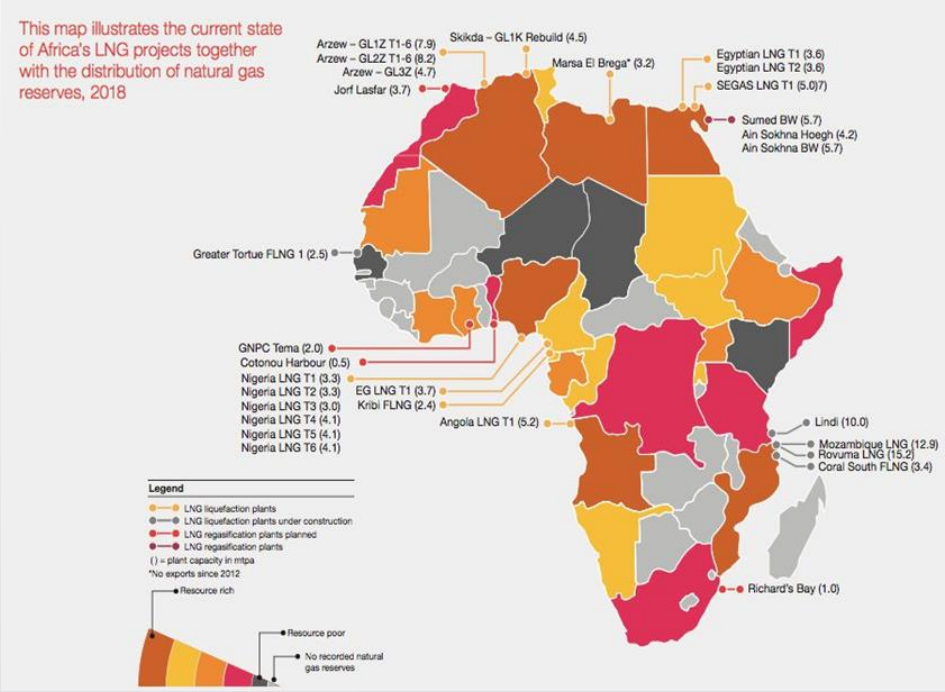
Renewable Energy Potentials for Green Hydrogen in Africa

- Enormous Wind and Solar resources
  - average daily potential of 4.49kWh/kWp with an installed capacity of just 4878.1MW (fDI 2021)
  - technical wind potential of almost 180,000 terawatt hours (TWh) per year (World Bank 2021)



Natural gas potentials for Blue Hydrogen in Africa

- Enormous Gas reserves in some countries
  - Nigeria – 203.16 trillion cubic feet, largest reserve in SSA, ranking 9th in the world (DPR, 2021).
  - Angola – 343 million cubic feet, 2nd largest reserve in sub-saharan Africa (OPEC 2020)



Associations, Research centres and events for hydrogen development in Africa

- African Hydrogen Partnership (AHP)
  - trade Association representing the whole continent
  - lay the foundation for establishing hydrogen economies and societies in Africa.
- Africa Green Hydrogen Alliance
  - aiming to make their continent a frontrunner in the race to develop green hydrogen
  - Kenya, South Africa, Namibia, Egypt, Morocco and Mauritania
- Important research centres for hydrogen
  - the West African Service Center on Climate Change and Adapted Land Use (WASCAL) in Ghana
  - the Southern Africa Science Center for Climate Change and Adaptive Land Management, (SASSCAL) in Namibia.
- Hydrogen forums and events
  - Green hydrogen production and utilization potentials in the African continent

African Hydrogen Partnership

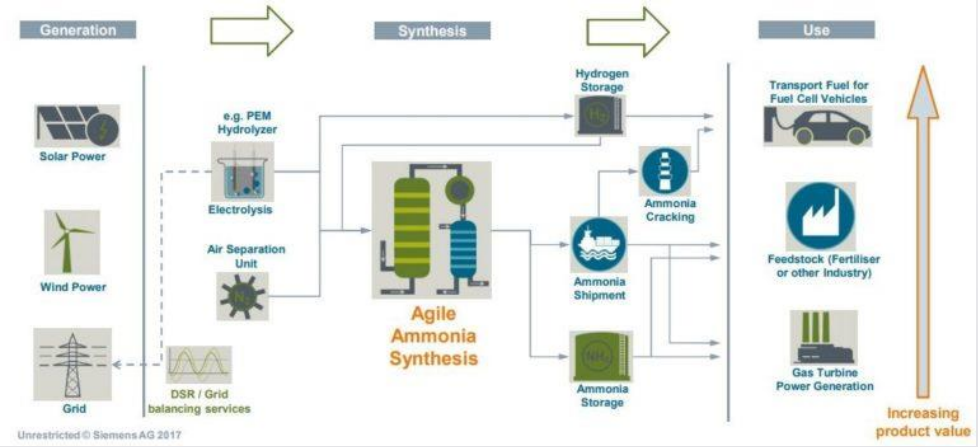
AFRICA GREEN HYDROGEN ALLIANCE

Prospects, Projects and Partnerships for Hydrogen development in Africa

- Different projects, applications and strategies in different countries and regions
  - South Africa → Green Hydrogen and Ammonia
  - Morocco → Green hydrogen and Ammonia
  - Namibia → Green Hydrogen
  - Congo (DRC) → green hydrogen through large hydro (Inga III)
  - Egypt → Green Ammonia
  - Mali → Natural Hydrogen
  - Uganda → Solar-Hydrogen & mini-grids
  - West Africa (WASCAL)→ Green Hydrogen export to the EU
  - Trans-saharan gas pipeline (Nigeria, Niger, Algeria) → Blue Hydrogen
- Pursued through various partnerships
  - North-South, South-South Partnerships
  - Regional partnerships
  - Public-Private sector partnerships

Potential applications of hydrogen: **Production of green ammonia**

- As a carbon-free asset, green ammonia has several potential applications, including:
  - Long duration renewable storage
  - As a transport fuel for fuel cells vehicles
  - As a feedstock as green fertilizer (production at point of consumption)
  - As an industrial energy source

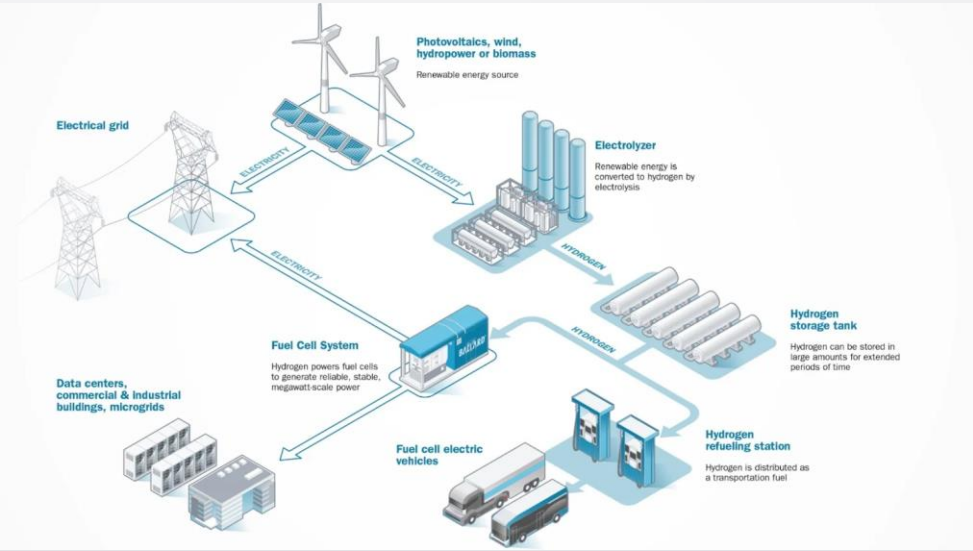


Cleantech 2019

Potential applications of hydrogen: Stabilization of RE grids

- As the share of variable renewable sources in the electricity mix grows, consistency of supply becomes a greater challenge

- Green hydrogen, with its capacity to store excess energy, provides a reliable solution to these fluctuations



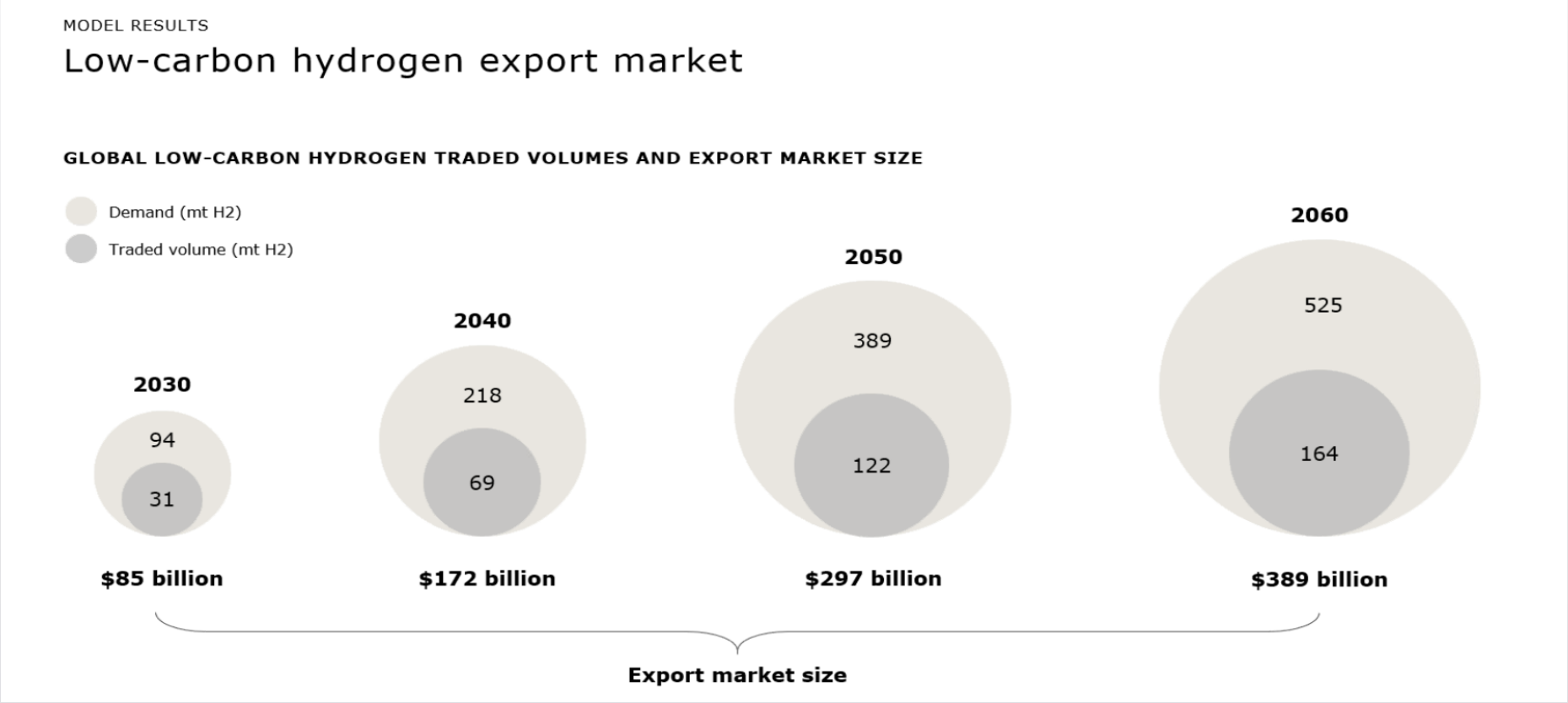
Ballard 2020

Potential applications of hydrogen: **Export potentials**

- Using the existing gas infrastructure, hydrogen can be transported via pipeline and connected to the European gas grid.

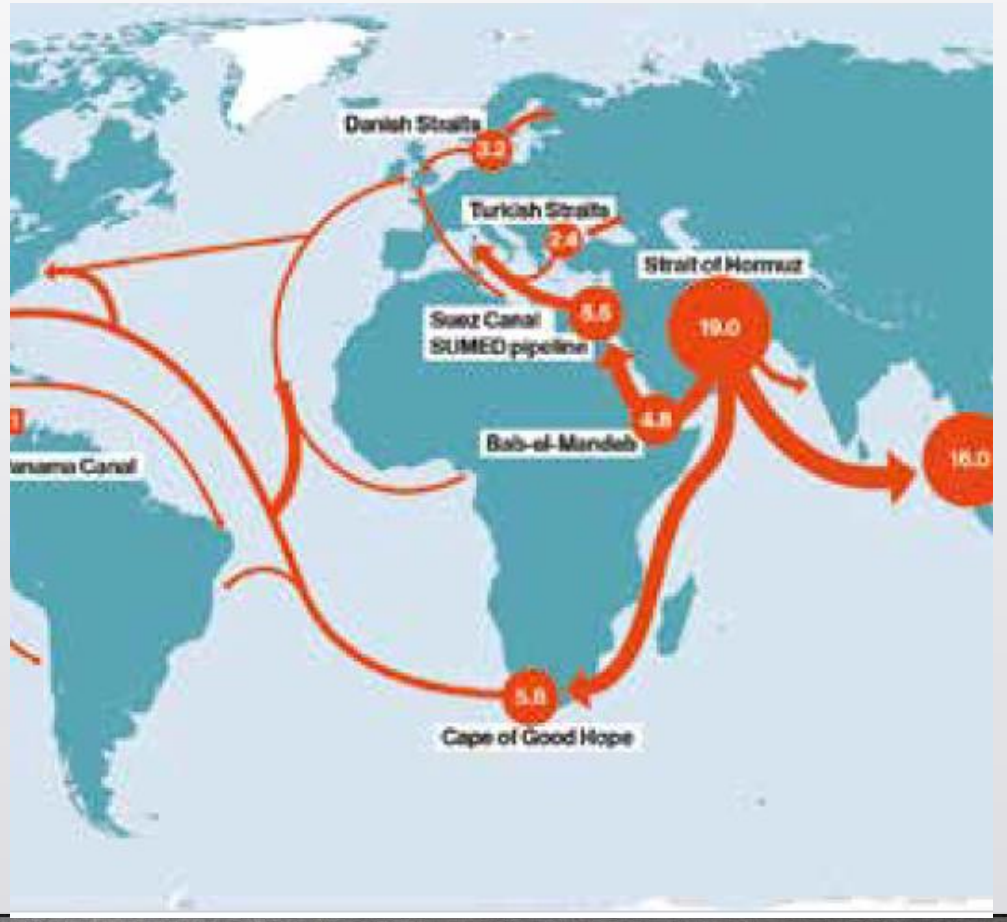
- Shipping of Liquified Hydrogen
  - The world's first liquefied hydrogen carrier, the Japanese **Suiso Frontier**, is currently under test.
  - 1,250 cubic-metre tank to hold the hydrogen is double-shelled and vacuum-insulated to help maintain the temperature.

Projections for continuously increasing green hydrogen market



Geopolitical implications of an African hydrogen economy

- Energy system shifts and changes
- Changes in global value chains (new nodes and hubs)
- Energy power reschuffle – formation of new powers
- Countries with high Fossil fuel rents
- Resource grabbing/raw material providers („green colonialism“)?
- Natural resource curse (value at stage of conversion)?
- Infrastructures and cross-border linkages (gas pipelines, landing zones)
- Lessons from Dessertec



Socio-economic implications of an African hydrogen economy

- Conflicts with existing resources (water, land)?
- Energy-food-water nexus
- Still focus on electrification agenda, energy access?
- Environmental and social impact assessments
- Local-level job creation
- Corporate social responsibilities
- Local-level awareness and sensitization?
- Inclusive growth and development?

Namibia's hydrogen plans and benefits

- Namibia, with a population of 2.5 million looks to harness the sun and wind resources to produce green hydrogen from seawater.
- Decarbornization
  - Utilization off rich renewable energy and other resources for decarbonization
  - Decarbonisation of Namibia's economy
  - Decarbonization of surrounding economies and region
- Economic development
  - Opportunities for industrial expansion
  - Job creation
  - Skills and technology transfers

Hyphen Hydrogen Energy

- Hyphen is a project development company formed to develop green hydrogen for domestic, regional and international markets
- A merger of the UK Nicholas Holdings Ltd & the German Enertrag
- Total investment: 10 billion USD; 3 GW of electrolyzers, 5-6 GW of RETs
- Infrastructures
  - Hydrogen pipeline backbone
  - Seawater desalination and water pipelines
  - Renewable and electricity infrastructure
- Plans to create permanent and temporary jobs

HYDROGEN ENERGY
HYPHEN

Reflections

- Prepare and engage
- Think Local first, then Global
- Seek and build relevant alliances and cooperations for hydrogen development.
- Maximize the potentials and use of low-cabon hydrogen wherever necesssary in industrial and electricity sectors

Thanks for your Audience

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