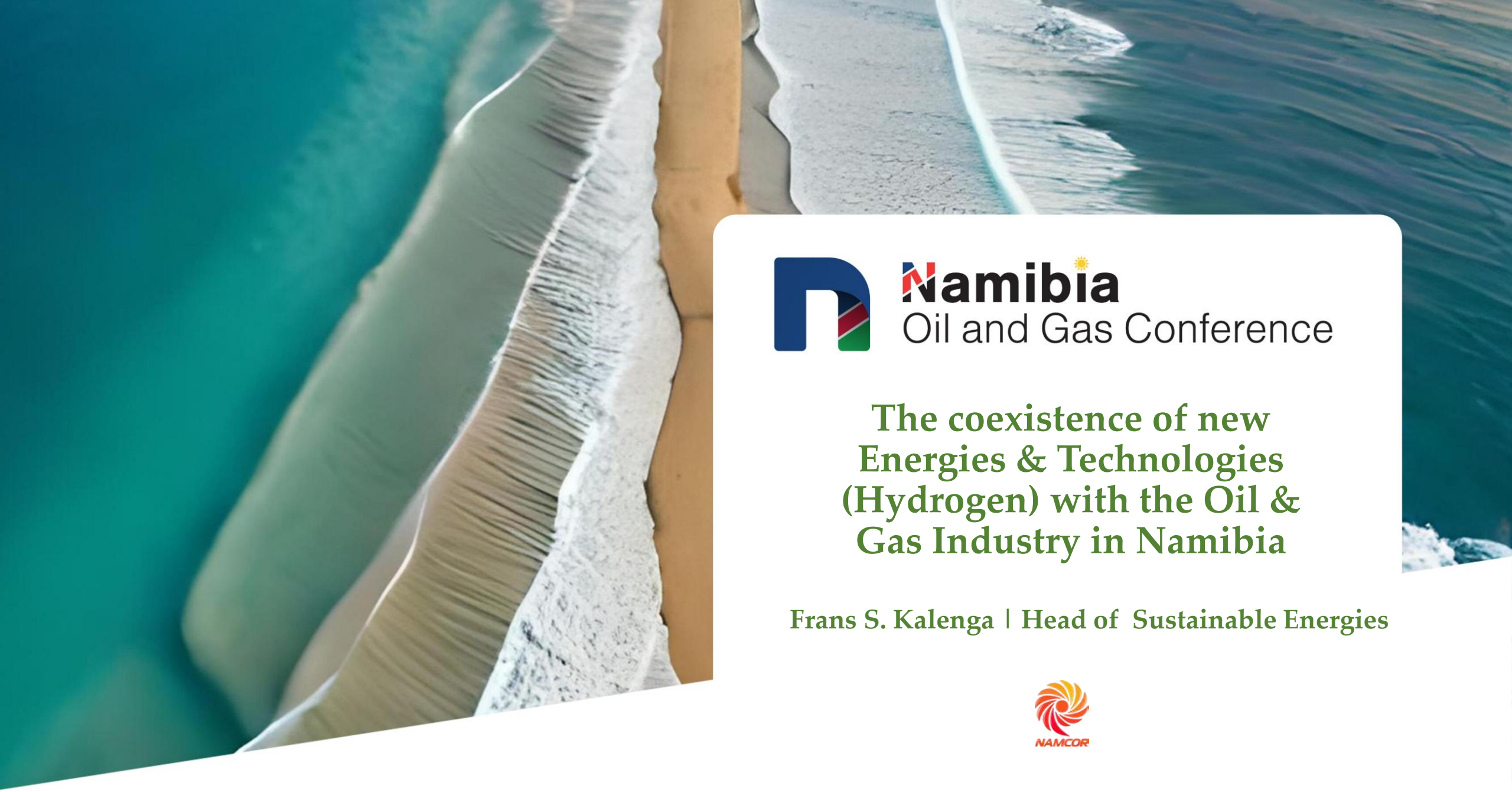


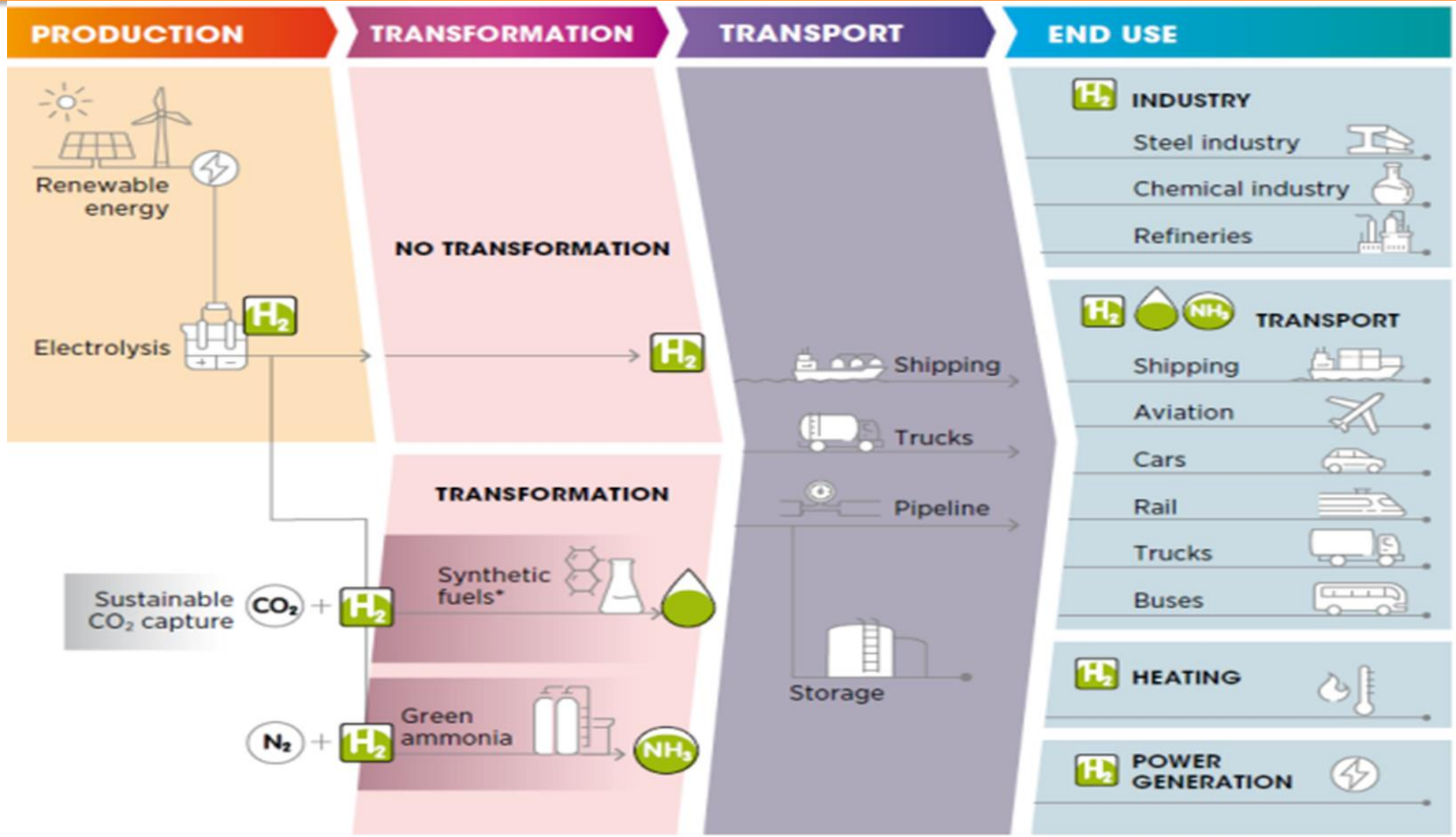
Namibia
Oil and Gas Conference

The coexistence of new Energies & Technologies (Hydrogen) with the Oil & Gas Industry in Namibia

Frans S. Kalenga | Head of Sustainable Energies

NAMCOR

Hydrogen 101: H2 EXISTENCE: STEAM METHANE REFORM = H2 + CO2



Source: (IRENA, 2020)

ENERGY EVOLUTION & THE BIG QUESTION 1

Can Oil and Gas Coexist with Hydrogen?

1. Coal – Oil – Electricity – Gh2

2.
   - Evolved over time, more than one source of energy exist over time
   - H2 is not an energy source but a carrier, hence it cannot replace Oil & Gas

3.
   - Countries doing GH2 but still have OIL & GAS
   - Saudi Arabia, Oman, Australia, Norway - All want to produce GH2 but have oil & gas and they will continue to produce oil & gas

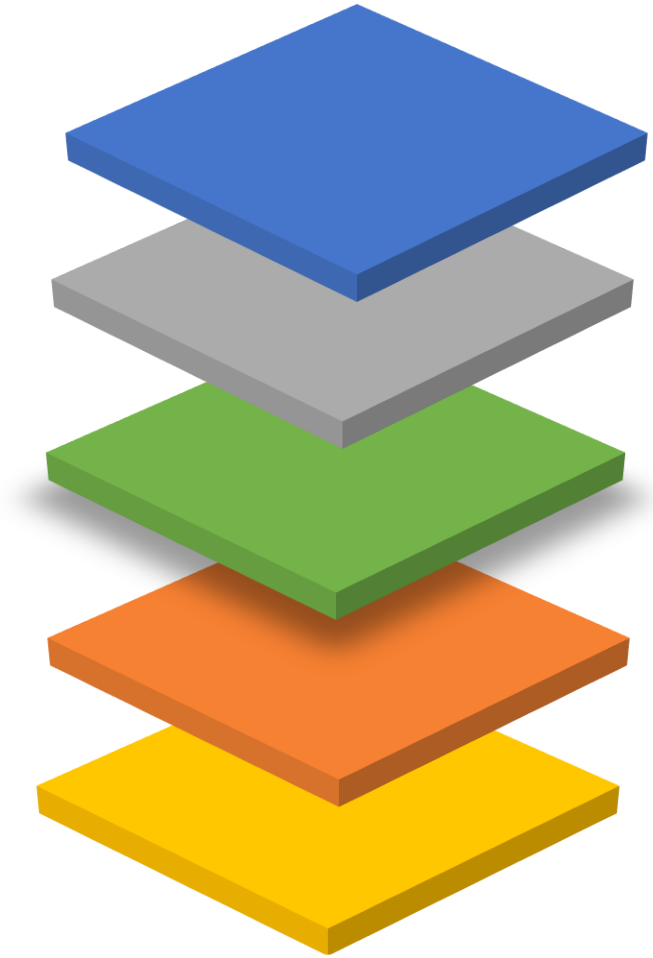
4.
   - Oman –active plans to transition from oil & gas to GH2 and Ammonia
   - Both industries are available at the same time in Namibia

ENERGY EVOLUTION & THE BIG QUESTION 2

How do you make the most of both?

Critical commodities (Oil - tried and tested but at sunset, GH2 - not fully tried and tested but at sunrise).

We can move fast to make the most of both and manage the economies depending on the demand



What are the Key priorities for the country? Energy security, Energy Efficiency, Energy poverty, decarbonization, energy transition or climate change

Energy poverty is real & Climate change is inevitable (drought, electricity generation & agriculture etc.) – We need to look after the climate

Avoid the Dutch disease by not relying on one source only

ROLE OF HYDROGEN IN THE OIL & GAS INDUSTRY

- Carbon Border Adjustment Mechanism (CBAM) - heavy tax for commodities if one is selling to European clients.
- The first phase of CBAM starts in Q4 of 2023, though taxation only commences in 2026

- The largest oil and gas producers globally are the biggest investors in hydrogen.
- They are hedging their bets because the oil and gas industry is in its twilight.

- China & India are coming up with new legislation (Tax = C02 emitted)

- Oil revenue to subsidize green industries in order to build new industries.
- Example of industries – Synthetics fuels, Aluminum Smelting, Zinc Smelting, Steel & Pig iron Manufacturing

- Hydrogen becomes critical due to its clean nature.
- Gh2 reduces carbon content of oil & gas

- Different Factories, New product and diversification of export sources, new jobs (direct & indirect), new revenue etc.
- GH2 scholarship, PETROFUND & NSFAF | GH2 vs OIL & Gas employment

Hydrogen Blending in Natural Gas Pipelines:

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Case Study:

The H21 North of England project in the United Kingdom is a demonstration of blending hydrogen into the existing natural gas grid.

The project aims to convert the gas supply in Leeds to a blend of 20% hydrogen and 80% natural gas.

By using the existing gas infrastructure, the project minimizes the need for new infrastructure development, making the transition cost-effective.

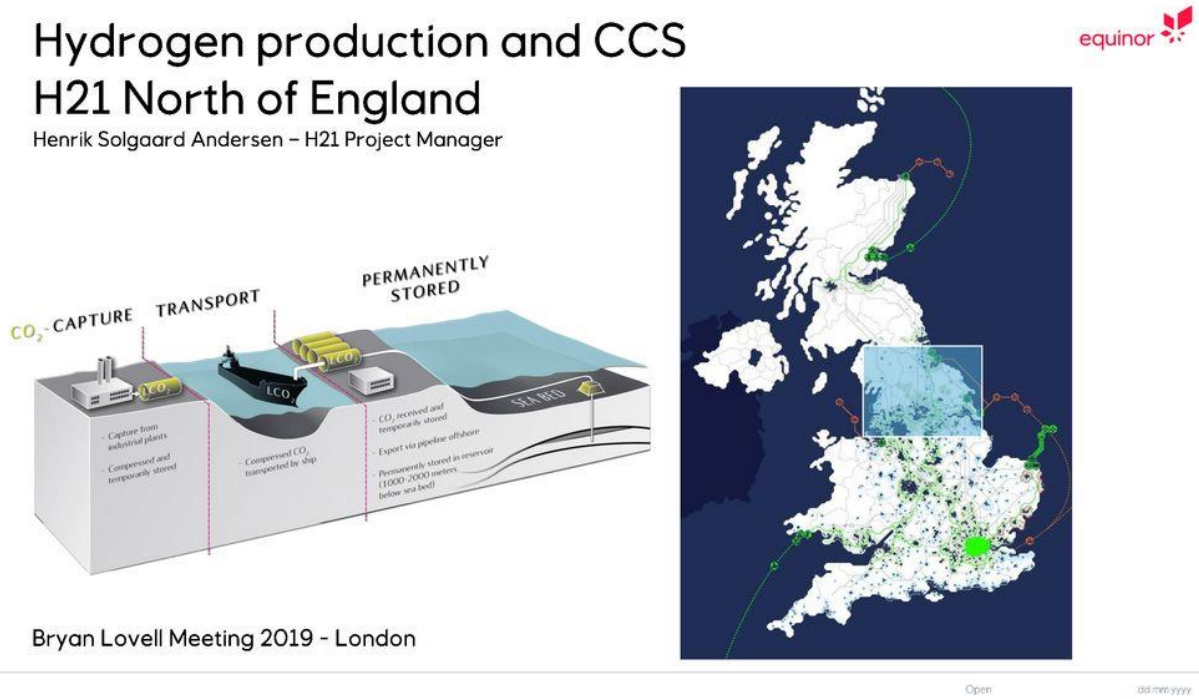
For Namibia, blending hydrogen into existing natural gas systems (pipelines, gas plants etc) can be critical in increasing overall efficiency (as hydrogen burns hotter than methane), but also for reducing GHG emissions.

Converting Natural Gas Infrastructure to Hydrogen: Case Study

- The Snam Rete Gas project in Italy aims to convert a portion of its natural gas pipeline network to transport hydrogen.
- By repurposing existing infrastructure, the project reduces costs and accelerates the development of a hydrogen economy.

Carbon Market Opportunities

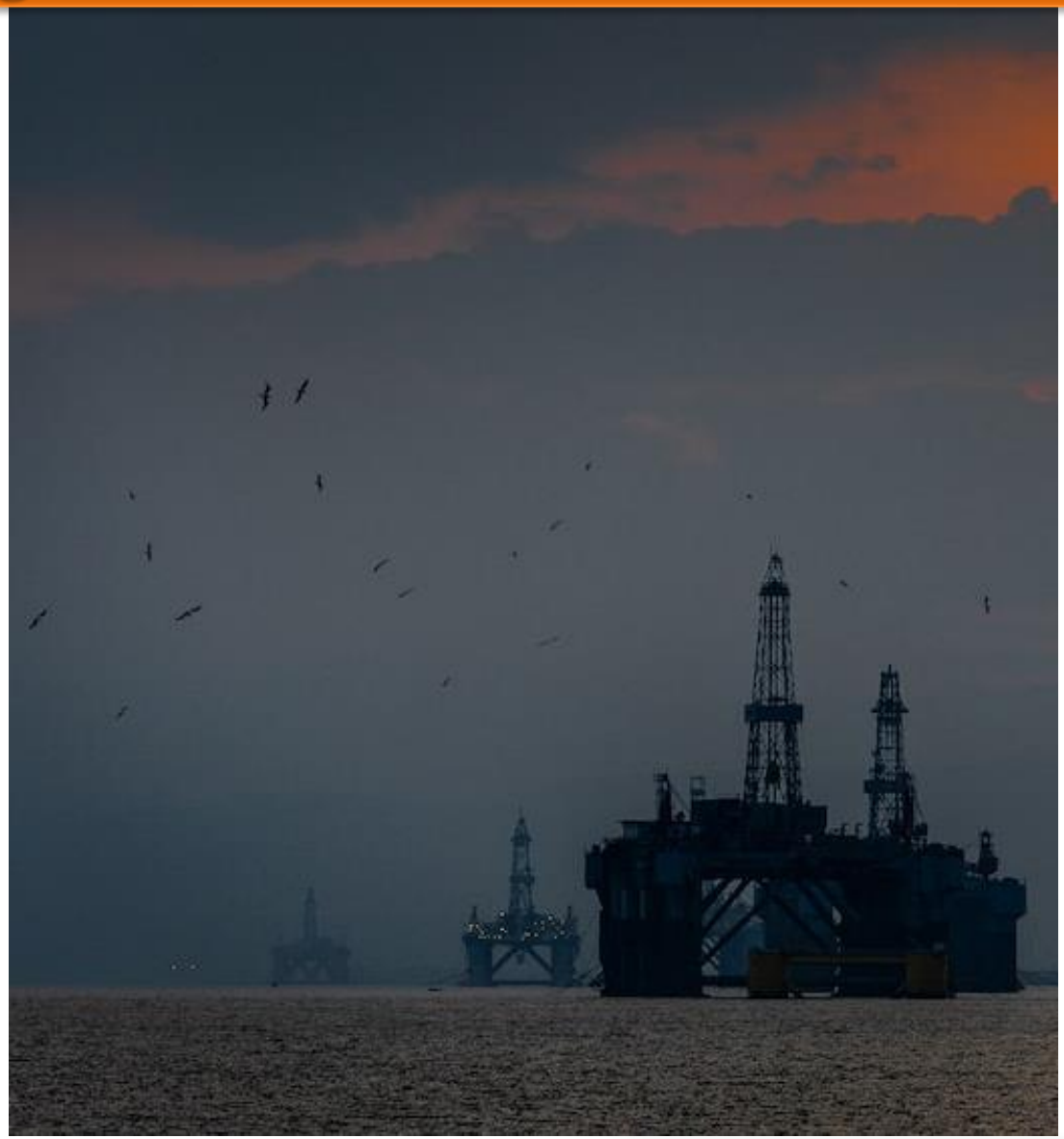
- Framework for carbon markets being developed
- Maximising the oil discoveries
- Trade
- Carbon Credit Offset



Source: https://cadentgas.com/news-media/news/november-2018/h21-hydrogen-for-north-of-england

Offshore Platforms powered by Hydrogen: Use Case

- Offshore oil and gas platforms can utilize hydrogen fuel cells to generate electricity and power their operations.
- Hydrogen fuel cells offer a reliable and emissions-free power source, eliminating the need for diesel generators.
- The Ormen Lange natural gas platform off the coast of Norway has successfully implemented hydrogen fuel cells to reduce its carbon emissions.

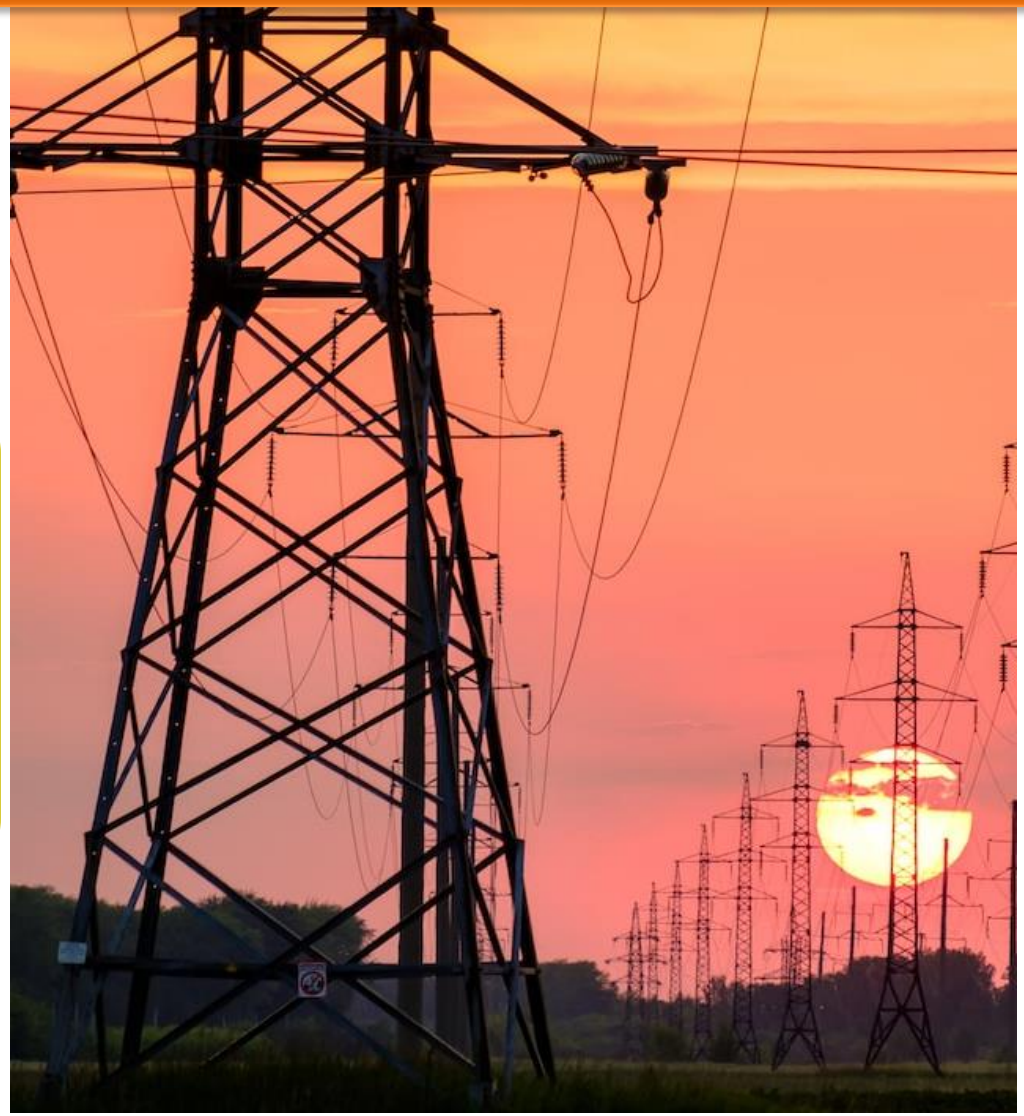


Hydrogen for Power Generation: Case Study

Many oil and gas installations are located in remote areas with limited access to traditional electricity grids.

In such cases, integrating hydrogen-based power generation can provide a reliable and clean energy supply.

Projects like the DolWin3 offshore wind platform in the North Sea use hydrogen-based energy storage systems to store excess renewable energy and supply power during periods of low wind or demand.



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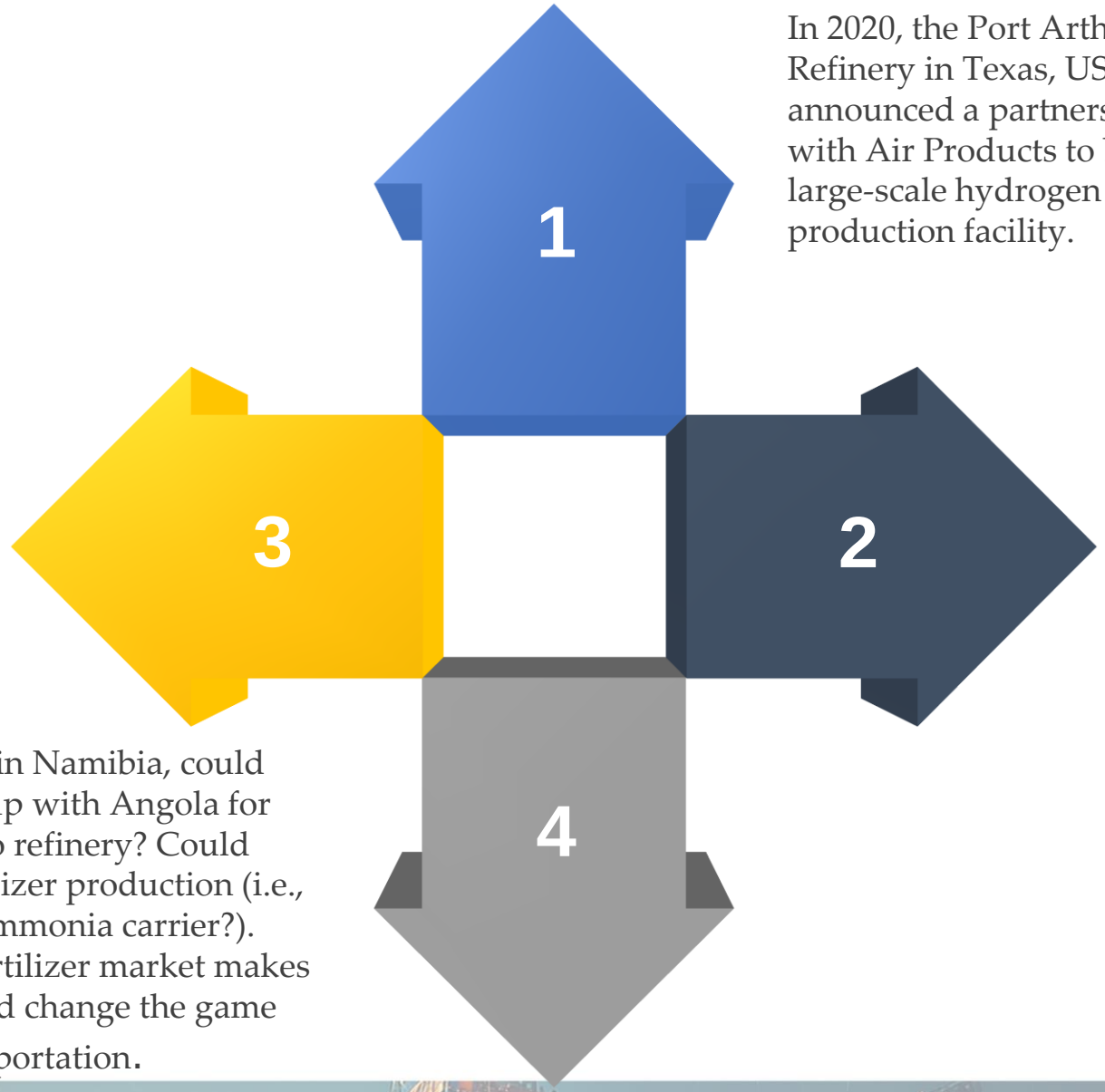
Hydrogen as a Decarbonization Solution for Refineries:



In 2020, the Port Arthur Refinery in Texas, USA, announced a partnership with Air Products to build a large-scale hydrogen production facility.

The facility will produce hydrogen from natural gas while capturing and storing the associated CO2 emissions.

The hydrogen produced will be used to desulfurize transportation fuels and reduce the overall carbon footprint of the refinery.
.

As there is no refinery in Namibia, could discussion be opened up with Angola for ship hydrogen for Soyo refinery? Could Namibia consider fertilizer production (i.e., beyond the planned Ammonia carrier?). Note: going into the fertilizer market makes at lot of sense and could change the game when it comes to transportation.

Hydrogen for Hydrogenation Processes in Refineries: Case Study

Oil refineries often use hydrogen in hydrogenation processes to upgrade heavy crude oils and produce cleaner fuels.

Integrating hydrogen production through electrolysis powered by renewable energy sources can significantly reduce the carbon footprint associated with hydrogenation processes.

Hydrogen for Enhanced Oil Recovery (EOR): Case Study

Hydrogen can be used in Enhanced Oil Recovery processes to improve the efficiency of oil production.

In some cases, hydrogen-rich gases produced during industrial processes or generated from renewable sources can be injected into oil reservoirs to facilitate the extraction of additional oil.

This approach not only increases oil recovery but also sequesters carbon dioxide, making it an environmentally beneficial method.

Sustainable Energies Opportunities

Scholarships/Education

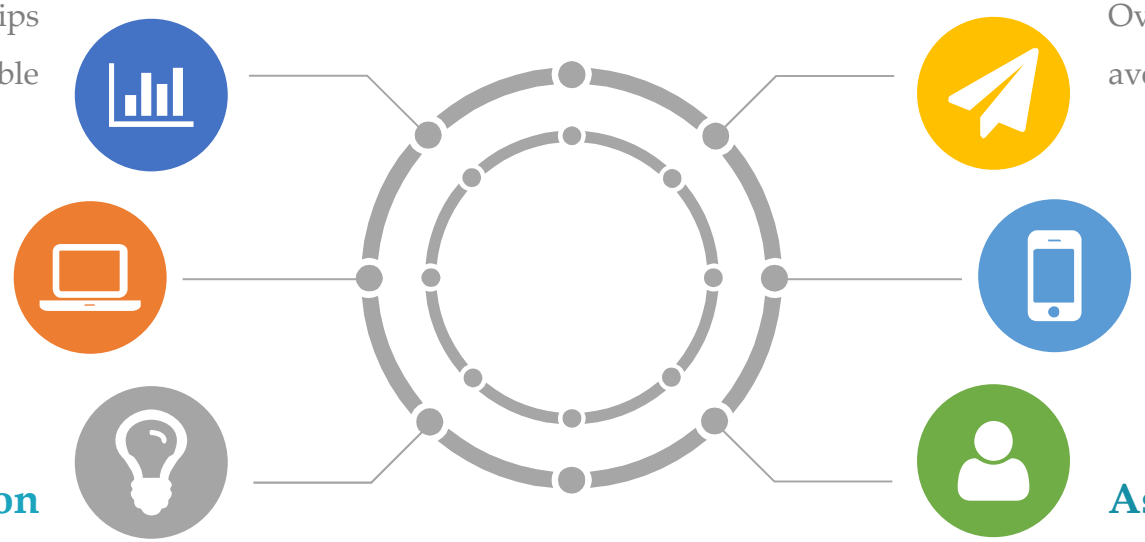
Through BMBF and the JCoI, Scholarships for over 200 Namibians are available

Services

Service Provider opportunities such as catering, cleaning, security, renovations

Value Addition

Development of value addition to Hydrogen products such as ammonia and fertilizer



Employment

Over 15 000 direct employment opportunities with average annual wages above N$ 100 000

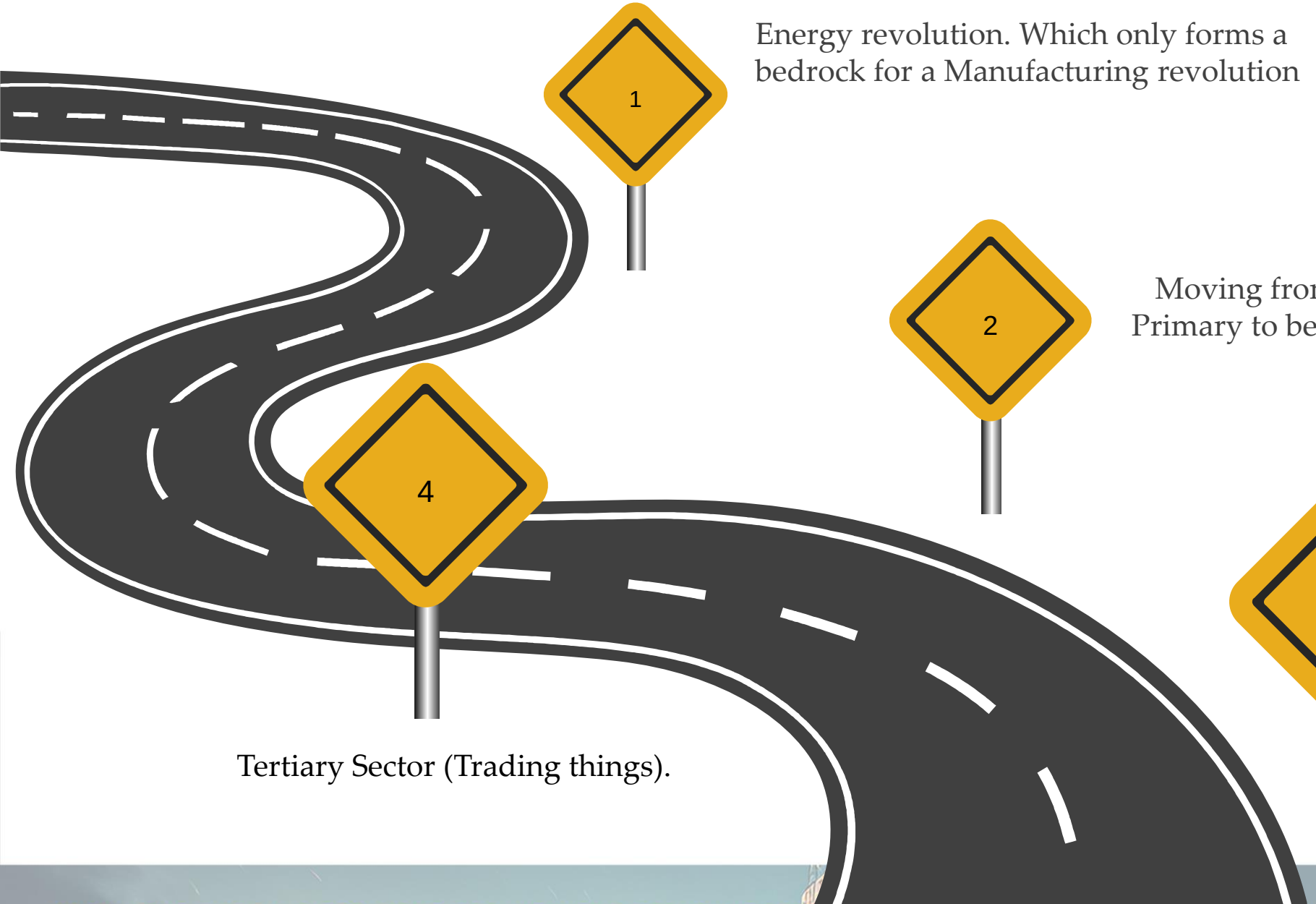
Construction

Construction opportunities as SMEs for roads, buildings, concrete, electrical, warehousing and houses

Associated and Enabling infrastructure

Housing, ports, roads and other infrastructure nodes required to enable the hydrogen economy

What is the End goal? Namibia an Energy HUB for Africa



Energy revolution. Which only forms a bedrock for a Manufacturing revolution

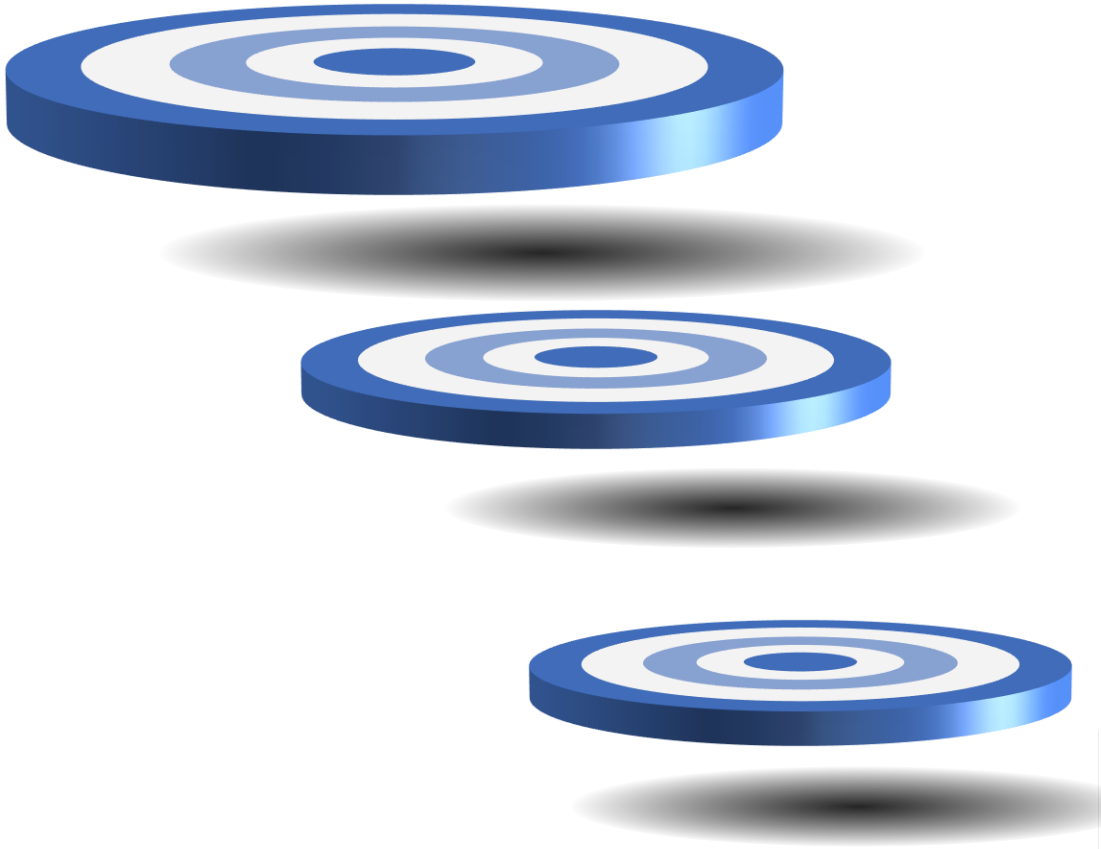
Moving from just selling resources Primary to beneficiation (secondary & Tertiary)

Secondary sector (making or creating things)

Tertiary Sector (Trading things).

Conclusion

- It is imperative to diversify beyond oil and gas, gaining competitive advantage and differentiation with low carbon technologies.
- The Namibian crude oil will be going into a shrinking market – so prices may not remain as high as it currently is due to most of global transportation becoming electric – moving from petrol to diesel.
- Hence, focusing on oil and gas alone might expose Namibia economically.
- Namibia is one of the few countries in the world with the alignment of critical resources – oil, gas, solar, wind, land and solid minerals.
- The only other country that could potentially come close to Namibia in terms of the above-mentioned alignment is Chile.
- Harnessing these on tandem has more value than doing in silos.



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