The Clean Hydrogen Economy: Industrializing Africa at Net-Zero

By:

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Africa is by far the continent with the lowest CO2 emissions, accounting for between 2% to 3% of global CO2 emissions (with South Africa accounting for about 33% of all CO2 emissions in Sub-Sahara Africa). However, with the prospects of increased intra-Africa trade because of the ambitions of African states under the **African Continental Free Trade Area** ("AfCFTA") it is inevitable for CO2 and other greenhouse gas ("GHG") emissions to increase with the expanded use of fossil fuels (coal, oil, and gas) in prospective industries[1] who intend to tap into the opportunities that the AfCFTA presents. In addition, the prospects of increased trade between African states and other strategic trading partners such as the United States, the European Union and China will also contribute to Africa's pie of GHGGHG emission to increase. As for the rest of the world, the commitment to decarbonization of the global economy has become stronger pursuant to the release of report titled **'Climate Change 2021: The Physical Science Basis'** dated August 2021 by the Intergovernmental Panel on Climate Change ("IPCC Report"). The IPCC Report has set-off the alarm bells that it may already be too late to meet the GHGGHG

emissions targets set in the Paris Accord, which has now re-emphasized the need for accelerated investment in clean energy technologies and has now largely solidified the significant role green hydrogen, as an alternate fuel source, can play as part of the energy transition away from fossil fuels (petroleum products etc) to meet the global target of reducing GHGGHG emissions to about 1.5 degrees Celsius.

For purpose of this paper, a rudimentary explanation of clean hydrogen is, hydrogen produced from a) fossil fuels with carbon capture storage of the GHG emissions (so-called blue hydrogen) or b) electrolysers powered by renewable electricity (so-called green hydrogen). According to PWC in its report '**Unlocking South Africa's hydrogen potential**' dated October 2020, the cost of production of grey hydrogen (produced from fossil fuels without any carbon capture storage) and to a smaller extent blue hydrogen currently account for nearly 96% of the total global hydrogen production. However, to meet the climate goals, investment in the production of green hydrogen and the end-use application of hydrogen will need to be significantly scaled-up between 2030 to 2050. The question then is: Although Africa's current GHG emissions are negligible in comparison to the United States, Europe, or China (collectively with emission of almost 80% of global GHG emissions), why should countries in Africa be part of the clean hydrogen economy from its inception?

The answer is probably relatively simple: Africa cannot afford to be left behind in the hydrogen economy and play catch-up with the rest of the world. Clean hydrogen presents a significant economic opportunity for Africa to industrialise its economies at net-zero – achieving or acceding the loadable objective of **Agenda 2063** in creating an industrial economy that overtime will provide clean, affordable, and sustainable energy sources to power industries that will be the catalyst for real growth and prosperity, creating meaningful and sustainable jobs. The history of the United States, Europe and more recently Asia has shown that great prosperity has only come from industrialisation through investment in significant manufacturing capacity. The future heavy industries required by Africa for real growth such as local steel manufacturing and cement manufacturing, including the increase in mobility within the continent through the increase of passenger vehicles, trucks, trains, and shipping because of intra-Africa trade presents African businesses with a vast market for hydrogen as a sustainable cleaner fuel source.

In the recent report of the World Economic Form titled '**Connecting Countries & Cites for Regional Integration: Operationalizing the AfCFTA**' dated 21 January 2021 the automotive industry is identified as an industry that could significantly contribute to the industrialisation of Africa. Africa is regarded as the final frontier for the global automotive industry as per capita income levels continue to rise, financial markets develop, and vehicles become more accessible for a greater share of the population. The continent is also home to nearly all the minerals required for the manufacturing of vehicles and components required for the running of such vehicles, which includes fuel cells powered by hydrogen. This industry is naturally considered as one of the biggest contributors to GHG emissions globally (both in the manufacturing process and ultimate use of such vehicles) and as such for Africa to develop a hydrogen economy around the automotive industry could potentially be one of the ankers for investment in hydrogen projects on the continent, which would fall squarely in green investment movement. Developing an automotive industry that ankers the hydrogen economy with steelmakers that use hydrogen for the manufacturing of the steel/alloys required for vehicles, manufacturers of electrolysers (required to produce green hydrogen) and passenger vehicles, trucks and trains that use hydrogen fuel cells for propulsion allows for industrialisation of Africa without being a significant GHG contributor. It potentially also allows Africa to use its fossil fuels (i.e., coal) to produce blue hydrogen as a part of the just transition to move away from the use of fossil fuels and increase renewable energy generation capacity (which in turn will promote and facilitate the production of green hydrogen). This will allow for the balancing of the developmental needs of Africa that has abundant fossil fuel resources but still achieve reductions in GHG emissions with the use of carbon capture storage. This allows for the scaling-up of green hydrogen capacity overtime which requires extensive investment in renewable electricity and electrolysers.

Countries such as South Africa has seen the significant future potential of hydrogen and is in the process of developing a national hydrogen roadmap for clean hydrogen, expected to be released sometime during 2022. For South Africa, including other African countries, it is important to recognize that as part of the economic integration process under the AfCFTA, hydrogen presents a sustainable opportunity for the entire continent. Countries such as South Africa

that currently have industries that could support hydrogen could be a catalyst for developing the clean hydrogen economy for the rest of the continent. As part of public-private sector initiatives in South Africa there has been extensive research and development in hydrogen for several years, specifically on the creation of a value chain around the platinum mining sector with the manufacturing of fuels cells for electric vehicles powered by hydrogen. South Africa, also being one of the biggest contributors to GHG emissions on the continent, the potential for developing an integrated hydrogen economy has resulted in the preparation of feasibilities studies on the hydrogen economy by various stakeholder. The first of such reports called the **South African Hydrogen Valley Report** was released in September 2021 and identified specific areas (the so-called hydrogen valley) in South Africa that holds significant potential for developing an integrated hydrogen economy. The report identifies various barriers required to be addressed to scale up the production of green hydrogen specifically to achieve cost-parity with fossil fuels in the future.

These barriers include:

• The sourcing of green electricity from renewable sources. Significant investment is requirement in renewable energy. There is currently also grid reliability concerns in South Africa with limited green electricity on grid.

• The need for investment in the manufacturing of electrolyser required to produce hydrogen, which by itself is capital intensive.

• The demand for end-use of hydrogen needs to be significantly scaled-up, for such there will be a need for clear targets and strategies to increase demand in the industrials and mobility industries.

• The need for infrastructure for the transportation and storage of bulk hydrogen, including getting the hydrogen to the end-user (i.e, refuelling stations etc).

Having identified the barriers to the market, the report recommends that clear policy and regulatory enablers will need to be put in place by the South African government to attract investments in the hydrogen value chain as the catalysts for tapping into the hydrogen economy. For Africa to potentially develop the

hydrogen economy on a continental level through, amongst others, the automotive industry it will be important to develop regional policies that complements the industrialisation ambitions of each individual state within a particular regional economic community. For African countries that are part of the AfCFTA, developing national industrial policies in isolation without regard to regional and continental integration of industries, will fail to recognize the benefits the AfCFTA holds for deeper economic growth and integration when approached on a regional level and ultimately filters into the continental market. As such uniform regional industrial policies will need to be developed that speak to how several of the barriers to a hydrogen economy will be addressed on a regional level. South Africa and Namibia are both considered markets that have significant prospects of becoming leading exporters of green hydrogen. It however appears that both countries are competing to become the Southern African hub for green hydrogen, as opposed to developing a coherent policy and regulatory approach thereto that would be complimentary to their respective goals.

The Hydrogen Council in its report titled '**Path to Hydrogen Competitiveness**' dated 20 January 2020 identified six ways in which governments can create an enabling environment to accelerate investment in green hydrogen to achieve significant scale in realising cost competitiveness for the end-use thereof in various applications (mobility, industrials etc) relative to fossil fuels (i.e., petroleum products) in the next decade. These six ways are:

• Developing national strategies that set national targets for the development of a hydrogen economy.

• Government being the co-ordinator of stakeholders within the country on potential local investment opportunities (i.e., Namibian government's example with the Southern Corridor Development Initiative).

• Developing laws and regulation around, amongst others, new hydrogen refuelling stations and developing internationally consistent regulation to limit market variables.

• Creating standardisation across the industry e.g., around pressure levels and safety in relation to the transportation, storage, and handling of hydrogen.

• Creating a framework that encourage investment in infrastructure required for the development of the hydrogen economy.

• Providing incentives to investors in the form of tax breaks or subsidies to encourage the initial acceleration of hydrogen in a country.

These six ways to accelerate hydrogen investment can similarly be applied in developing regional policies, creating a uniform regional hydrogen investment framework to which national policies and laws are pegged. Without uniform and coordinated regional industrial policies to tap into emerging industries such as the hydrogen economy we will potentially not fully realise the potential of an industrialised Africa. The **Draft Pan African Investment Code**, which is understood to serve as a guide for the negotiation of the AfCFTA Investment Protocol, contains a broad framework of incentives to encourage and support investments. It also contemplates that member states may harmonize incentives for strategic interest to member states or as prescribed by the relevant African Union bodies. As part of the incentive framework being negotiated under the Protocol, it will be important for the Protocol to set principles for Africa states to encourage private sector investment in low carbon or carbon neutral industries such as clean hydrogen to accelerate the industrialisation of Africa at a low carbon base.

Uniform legal principles, incentives, infrastructure, and industry standards (i.e., on pipelines, storage etc) should then find its way into regional industrial policies and filter into the domestic laws of the countries within that region. This ensures a harmonised approach to developing the hydrogen economy within the region. In the case of South Africa and Namibia, deeper collaboration in the development of the Southern Corridor area in Namibia and Boegoe Bay area in South Africa as green hydrogen export hubs will be beneficial for both countries, including the Southern African region and the continent broadly. Regional value chains supported by robust and integrated regional policies that supports and nurtures emerging industries is imperative for Africa to realise the economic growth to achieve Agenda 2063. Hydrogen could be one of the game changers for Africa and if approached regionally has the potential to materially impact on Africa's industrialisation, as it allows for the investment in heavy industries such as the automotive industry, steelmaking, ammonia production and other complimentary downstream industries at net-zero. With hydrogen,

Africa could industrialize at net zero without compromising the climate and achieving sustainable development, thereby achieving Agenda 2063.

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[1] Local producers or manufacturers of goods, logistics & freight companies that need to transport such goods.

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