



South Africa's green hydrogen strategy: Challenges and opportunities



Significant global efforts have been dedicated to mitigate the man-made impacts of climate change and environmental degradation. However, recent policy shifts by some of the major economic jurisdictions, such as the United States, to focus on prioritising domestic economic growth, potentially at the expense of climate change, and stricter environmental regulation is a major cause for concern. For example, the US's policy changes to truncate the roll-out of electric vehicle incentives and subsidies, among other roll-backs on clean energy transition initiatives, will provide interim fiscal relief but may inadvertently undermine climate change mitigation measures in the long term. In addition, the emerging geoeconomic order and tariff regimes will also have a disproportionate impact on both the demand-side and supply-side of

climate-neutral technology cooperation and financing mechanisms. Consequently, this will delay the deployment of nascent interventions required to reduce emissions from energy- and greenhouse gas intensive industries. Obviously, the impact is disproportionately high in critical but hard-to-abate industries such as cement clinker production, iron and steel manufacturing, and public transportation, of which their global CO₂ emissions are estimated to be roughly 8%, 7-9%, and up to 14%, respectively.

Due to the high costs of technology development and complexity of integration into existing systems, global cooperation in the development and financing mechanisms for sustainable climate-friendly technologies, such as green hydrogen, carbon capture, and storage technologies, has immense benefits to mankind. Green hydrogen, in particular, is considered to be one of the most promising energy carriers with immense environmental benefits. According to the Green Hydrogen Organisation (<https://gh2.org/what-green-hydrogen>), green hydrogen is produced via an electrochemical process to split water into hydrogen and oxygen using renewable sources of energy. Several technologies to produce green hydrogen at scale have been developed and/or are at different stages of development and commercialisation. However, each technology regime is characterised by its own inherent challenges and opportunities in terms of interoperability, efficiency, costs and availability. With substantial support from industry, policymakers and the public, the roll-out of green hydrogen technologies has been touted as a gamechanger, with massive global strategic efforts being deployed towards technology development and establishment of infrastructure and special economic zones, supported by the promulgation of targeted industrial policies as well as support with tax incentives and subsidies.

As part of the dual drive to attain both economic and energy sovereignty, South Africa launched an ambitious green hydrogen strategy to leverage the country's abundant renewable energy resources, both for domestic use and for export. The Hydrogen Society Roadmap was launched in 2021 to support the implementation of the country's green hydrogen economy, and its implementation is anchored on the attainment of four strategic outcomes, viz, (1) creating an export market for the country's green hydrogen and allied products, (2) greening the power generation, (3) decarbonising the transportation and heavy industries and, (4) localising the green hydrogen supply chains. According to the Hydrogen Society Roadmap (<https://gh2.org/countries/south-africa>), the country aims to produce approximately 500,000 tonnes per annum of green hydrogen by 2030, achievable by 10 GW of electrolysis capacity in the Northern Cape special economic zones by 2030, and up to 15 GW by 2040. In addition, the Hydrogen Roadmap targets the deployment of 100 hydrogen-powered buses and trucks by 2025 and up to 500 buses and trucks by 2030, with the opportunity to create and sustain up to 30,000 jobs annually by 2040. According to a report by National Business Initiative (<https://www.nbi.org.za/green-hydrogen-presents-the-opportunity-as-the-fuel-for-the-future/>), South Africa has the potential to produce green hydrogen for USD1.60 per kg by 2030, one of the lowest costs worldwide. These ambitious energy transition targets are applaudable, despite the challenges to achieve them being the stated timelines and current technoeconomic landscape. In

President's Corner *(continued)*

addition, there is an urgent need to revisit the assumptions used to formulate the stated impact targets, if one is to take into account the unprecedented number of bankruptcies by green hydrogen technology startups and established global companies due to inhibitive development costs and complexity of the associated systems and technologies.

Indeed, green hydrogen is going to be a game-changer due to its potential to drastically reduce greenhouse gas emissions and drive innovations in sustainable technologies. However, it is evident that the suite of technologies to produce green hydrogen are emerging technologies, which are disproportionately prone to failure due to the high costs of electrolyser technologies, complexity of integration, and intermittency of renewable energy storage systems, among other challenges. Synergistic to bottlenecks from the complex technology systems is the valley of death faced by green hydrogen technologies due to misallocation of financing, and the “Lindy effects” arising from sunk costs and perceived performance of established fossil fuel-based technologies. Although the challenges in the roll-out of green hydrogen technologies is a global phenomenon, reliance on imported technologies, high cost, and availability of climate finance, further increases vulnerability for countries in the global south, South Africa included.

I had the privilege of listening to a keynote address by the Chairperson of SAIMM Limpopo Branch, Mr Steven Zulu, at the branch event held at the University of Limpopo earlier this month. In his opening address, Mr Zulu highlighted the need to develop sustainable technologies based on endogenous technology learning capabilities as a sovereign strategy to mitigate against perpetuation of external dependency, a phenomenon he referred to as “technology colonialism”. In particular, Mr Zulu highlighted some basic implementation strategies to attain technology sovereignty, such as building sustainable R&D and technology development skills. Furthermore, he emphasised the importance of developing home-grown technology alternatives, drive down technology costs, and unlock the ability to reverse engineer existing technologies to suit the domestic market requirements.

In conclusion, there is no doubt that green hydrogen can be a game-changer for South Africa and the region. However, the attainment thereof, together with the Green Hydrogen Roadmap impact targets, risk being wishful thinking unless collective efforts are channelled towards intensifying technology development initiatives to drive down costs and reduce dependency on imported technologies and components. Most importantly, open-minded approaches are required to take advantage of emerging geoeconomic dynamics, so as to establish genuine collaborations with all leading green hydrogen technology developers globally. As the SAIMM, we commit to continue supporting the dissemination of technical knowledge required to sustain the localisation of technology know-how in this highly contested domain.

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