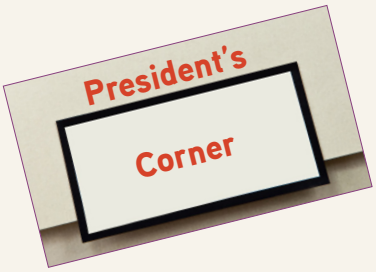

Hydrogen-fuelled trucks and inspiration

In 1874, science fiction author Jules Verne set out a remarkably insightful vision that has inspired innovators in the 145 years since. In his book *The Mysterious Island*, Verne wrote of a world where 'water will one day be employed as fuel, that hydrogen and oxygen which constitute it, used singly or together, will furnish an inexhaustible source of heat and light, of an intensity of which coal is not capable'. As an avid reader I read all Jules Verne's books in my youth and have a soft spot for the author anyway. But when I recently returned to this book, this insightful remark gave me goosebumps of excitement. In a culture obsessed with measuring talent and ability, we often overlook the importance of being inspired. In my opinion, inspiration is the spark that opens the mind to new possibilities and propels a person from apathy to possibility. Inspiration transforms the way we perceive the possible. Perhaps inspiration is often overlooked because of its elusive nature.

Inspiration recently came for me in the form of the launch of the world's biggest hydrogen-powered truck. Anglo American unveiled their retrofitted haulage vehicle at the Mogalakwena platinum mine in Limpopo Province amidst a lot of fanfare and excitement in early May 2022. The hydrogen-powered retrofitted diesel truck is a result of many years of work and commitment. The vehicle is a tangible outcome of Anglo American's committed strategy to reduce their carbon footprint, thus also tangibly playing a role in the South African and global energy transition in mining. Anglo's hydrogen-powered truck is an inspirational game-changer and a remarkable milestone for the mining sector in general. This massive truck weighs 220 t with a load capacity of 290 t, giving it a total weight of a mindboggling 510 t.

Known as the nuGen Zero Emission Haulage system, the hydrogen-powered truck is retrofitted from a diesel-powered vehicle, employing a hybrid hydrogen fuel cell providing roughly half of the power and a battery pack the other half, to allow energy recovery from braking. The 2 MW hybrid power system, which replaces the diesel engine, was designed by Anglo American and First Mode in Seattle, USA. A conventional diesel truck of this size would use around 3 000 litres of diesel per day, generating 8 t of carbon dioxide. Anglo American also intends to use South Africa to prove up its hydrogen truck technology for global implementation. The plan is to retrofit 40 diesel trucks at Mogalakwena platinum mine, the largest open-pit platinum mine in the world, and later roll out the concept to all 400 haulage trucks in the fleet. Haul trucks account for 80% of diesel emissions at Anglo's mining sites globally, so a conversion to hydrogen and battery power will make a substantial contribution towards carbon neutrality for the company. Hydrogen enters the fuel cell from the tank and mixes with oxygen to form water in a chemical reaction catalysed by platinum. This reaction generates electricity that is used to power the motors that drive the wheels. The only emission from the vehicle is water vapour. To facilitate the piloting phase at Mogalakwena, Anglo has built a zero-emission hydrogen production, storage, and refuelling complex, which includes the largest electrolyser in Africa, tied to a captive solar photovoltaic field.

President's Corner *(Continued)*

Given the importance of platinum group metals (PGMs) in the production of electrolysers used to produce green hydrogen, it is fitting that Anglo Platinum has been chosen as the hub of the nuGen programme. The end-to-end integrated green hydrogen production, fuelling, and haulage system implemented at Mogalakwena has the potential to cut up to 80% of the diesel emissions generated in the opencast mine environment. The launch of Anglo's nuGen truck provides a real-world example of the potential of hydrogen to shift mining towards a wider adoption and use of hydrogen across the heaviest duty forms of transport, for which hydrogen carries numerous advantages over battery technology. Moving away from diesel-guzzling trucking can substantially shift the carbon footprint of mining and transport in general. The nuGen project is, however, not an isolated breakthrough or milestone. For about 20 years, various research and academic institutions locally and globally have been part of a network focused on building capacity and technology associated with a future hydrogen economy.

Recently a joint feasibility study, coordinated by the Department of Science and Innovation (*Hydrogen Valley Feasibility Study Report*[1], dated October 2021), identified three hubs with a fundamental role to play in integrating hydrogen into South Africa's economy with the intent of establishing the country as a strategically important centre for green hydrogen production. The study evaluated the potential for a 'hydrogen valley' to be developed in the Bushveld Complex geological area and beyond, based on nine key pilot projects centred on the three main hubs. The hubs include Johannesburg, extending to Rustenburg and Pretoria; Durban, encompassing the city itself and Richards Bay; and Limpopo Province, centred on Anglo American's Mogalakwena PGMs mine. The study identified the adoption of fuel cells for forklifts in Durban and Richards Bay ports for large mining haul trucks across the country, for buses in Johannesburg, and to power data supply centres in Limpopo and for offices in Johannesburg and Pretoria.

Therefore, the successful piloting of the nuGen truck has elicited such excitement and inspiration for me. The pathway towards a hydrogen economy has been a long and winding one to date, but finally we are seeing a real-world, commercial example of what can be done. The nuGen truck is a symbol of sorts of a new generation of clean technologies in large mining haul trucks , and opens up a much larger scope for the economy that can accelerate the goal of carbon neutrality while creating commercial opportunities and jobs where they are most needed. And Jules Verne's prediction is increasing becoming our reality, a reality that has the potential to make a real change.

'If you always do what you've always done, you'll always get what you've always got.' - Henry Ford, founder of the Ford Motor Company.

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[1]https://www.dst.gov.za/images/2021/Hydrogen_Valley_Feasibility_Study_Report_Final_Version.pdf