

CSIR and NWU spearhead emerging hydrogen research area

The CSIR has been appointed by the Department of Science and Technology (DST) to establish a Hydrogen Centre of Competence (CoC) to focus on hydrogen production, storage, delivery and distribution. The CoC will be established jointly with the North-West University (NWU).



Hydrogen and fuel cell technologies have been identified by the DST as a 'Frontier Science and Technology' initiative that will potentially expand the base for the creation of wealth and position the country to compete within the dynamic knowledge economy. This initiative would foster proactive innovation and knowledge generation in beneficiation of key natural resources, resulting in new downstream industries.

Globally, hydrogen and fuel cells are seen as energy solutions for the 21st century, enabling clean and efficient production of power and heat from a range of primary energy sources. The transition to a hydrogen economy is expected to greatly reduce dependency on oil and gas, and reduce carbon dioxide emissions.

South Africa is in a unique position to participate in the emerging hydrogen economy. With more than 75% of the world's platinum reserves, it holds a dominant position. Platinum is the key catalytic material used in hydrogen fuel cells. Socio-economic benefits could also result from value addition to key natural resources, such as platinum.

The country has a leading position in high-temperature gas-cooled nuclear reactors, such as the Pebble Bed Modular Reactor technology. The technology is key in the production of industrial-scale process heat that could be used in thermal electrolysis to generate hydrogen for use in fuel cells. Furthermore, South Africa is regarded as a leader in the technology to produce liquid fuels from coal through gasification.

The Hydrogen CoC will function in a hub-and-spoke collaborative mode, which is a mechanism to bring together all interested stakeholders to deliver on a long-term vision. The CoC, in its network form, will create a coherent and dynamic action plan to achieve that vision. It will steer the implementation to deliver on agreed programmes and will generate sustainable competitiveness and world leadership for the country by stimulating increased and more effective investment in research and development, accelerated innovation and through eliminating barriers to the deployment and growth of hydrogen and fuel cell technologies.

The CoC also has the benefit of providing an opportunity to develop a knowledge base that can contribute at the forefront of an emerging industry, creating socio-economic opportunities for the nation.

Hydrogen economy

A hydrogen economy is a hypothetical economy in which the energy needed for motive power (for automobiles or other vehicle types) or electricity (for stationary applications) is derived from reacting hydrogen (H_2) with oxygen. While the primary purpose is to eliminate the use of carbon-based fossil fuels and thereby reduce carbon dioxide emissions, a secondary goal is to provide an energy carrier to replace dwindling supplies of petroleum.

In the context of a hydrogen economy, hydrogen is an energy-storage medium, not a primary energy source.

Nevertheless, controversy over the usefulness of a hydrogen economy has been confused by issues of energy sourcing, including fossil fuel use, global warming and sustainable energy generation. These are separate issues, although the hydrogen economy impacts all of them.

Proponents of a hydrogen economy suggest that hydrogen is an environmentally cleaner source of energy to end-users, particularly in transportation applications, without release of pollutants (such as particulate matter) or greenhouse gases at the point of end use. Analyses have concluded that "most of the hydrogen supply-chain pathways would release significantly less carbon dioxide into the atmosphere than would gasoline used in hybrid electric vehicles" and that significant reductions in carbon dioxide emissions would be possible if carbon capture or carbon sequestration methods are utilised at the site of energy or hydrogen production.

Critics of a hydrogen economy argue that for many planned applications of hydrogen, direct distribution and use of energy in the form of electricity, or alternate means of storage, such as chemical batteries, fuel plus fuel cells, or production of liquid synthetic fuels from carbon dioxide, might accomplish many of the same net goals of a hydrogen economy, while requiring only a small fraction of the investment in new infrastructure.