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ENVIRONMENTAL LAW **ALERT**

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Green hydrogen: The new kid on the green energy block and its potential environmental permitting requirements and challenges

South Africa has made significant strides in recent years with renewable energy and its transition towards a low carbon economy. Onshore wind and solar photovoltaic power plants have dominated the renewable energy landscape, however renewable technologies are evolving at a rapid pace with new technologies and exciting offshoots coming to the fore. One such technology offshoot is the production of green hydrogen from renewable energy facilities, which is emerging as a promising fuel alternative, with the World Economic Forum identifying it as one of the top 10 emerging technologies.

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Green hydrogen: The new kid on the green energy block and its potential environmental permitting requirements and challenges

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South Africa has made significant strides in recent years with renewable energy and its transition towards a low carbon economy. Onshore wind and solar photovoltaic power plants have dominated the renewable energy landscape, however renewable technologies are evolving at a rapid pace with new technologies and exciting offshoots coming to the fore. One such technology offshoot is the production of green hydrogen from renewable energy facilities, which is emerging as a promising fuel alternative, with the World Economic Forum identifying it as one of the top 10 emerging technologies.

The South African environmental permitting framework in the renewable energy space has developed and matured over the past 20 years under the National Environmental Management Act (NEMA). Novel hydrogen technologies bring forth new challenges to both developers, lenders, environmental assessment practitioners, and regulators as the risks and impacts related to green hydrogen production are new and still being understood. This alert explores the potential environmental permitting requirements that hydrogen technology could trigger. For more information on green hydrogen from an energy perspective, please refer to CDH's previous Energy Sector alert.

Hydrogen technologies vary based on production methods. Although the end product is similar, the carbon emissions during the production phase differs. Hydrogen is produced through the electrolysis of water by utilising a high electrical current to split water into pure hydrogen gas and oxygen. If the electrolysis process is powered by renewable energy, the hydrogen produced is classified as green hydrogen (Green Hydrogen). Green Hydrogen can be used for energy generation through hydrogen fuel cells or to produce green ammonia (Green Ammonia) (collectively Green Hydrogen Technologies).

The use of Green Hydrogen has been identified as being beneficial to various sectors, including the transport sector, either through direct combustion and the creation of heat or through an electrochemical reaction inside a fuel cell. The use of Green Hydrogen within the transport sector is more advantageous with water being the only by-product. Green Ammonia can also be utilised to replace diesel in the shipping sector, providing a zero-carbon fuel benefit and limited redesign of existing shipping diesel engines e.g. Green Ammonia can also be utilised to replace diesel in the shipping sector, providing a zero-carbon fuel benefit and *requires* limited redesign of existing shipping diesel engines.

Green Hydrogen Technologies present different challenges and risks as a green energy source. Green Hydrogen is very flammable and must be stored within high pressure tanks. The storage requirements also limit its transport capacities as it cannot be as easily transported as petroleum products and gas. High-pressure hydrogen fuel tanks in hydrogen vehicles and transport vehicles hold a significant safety risk especially during collisions. To address this challenge the storage tanks are double or triple walled.

Green hydrogen: The new kid on the green energy block and its potential environmental permitting requirements and challenges...*continued*

The potential environmental impacts and permitting requirements for Green Hydrogen Technologies will need to be assessed on a case by case basis with some of the permits and associated triggers explored briefly below.

The production of Green Hydrogen also presents its own environmental challenges as it is a water intensive process and requires the use of a high quality treated water. The production of 1kg of Green Hydrogen requires up to nine litres of water. The use of reverse osmosis plants to treat water may use up to four litres of water for every litre of treated water produced and may result in significant brine discharge. While the desalination of sea water is another option being considered as a viable water resource for Green Hydrogen, this is an energy consuming process as it requires on average 1 kilowatt-hour per cubic meter of water produced and also produces brine discharge. The extensive water requirements for Green Hydrogen production therefore presents demands for water in a water scarce country like South Africa.

The potential environmental impacts and permitting requirements for Green Hydrogen Technologies will need to be assessed on a case by case basis with some of the permits and associated triggers explored briefly below.

NEMA requires certain listed activities to obtain environmental authorisation (EA) before commencement thereof. Various activities associated with the production of Green Hydrogen Technologies, for example:

- the development of facilities or infrastructure for the generation of electricity from renewable resources;
- site clearance and construction of access roads;
- transfer and storage of water;
- storage of Green Hydrogen and Green Ammonia (dangerous goods); and
- water treatment processes.

These will trigger the need for an EA and possibly a waste management licences in terms of the National Environmental Management: Waste Act, depending on the activities, design, layout and location of the development.

The desalination of water will also require an EA subject to the production capacity, while the discharge of brine from the desalination process into coastal waters will likely trigger requirements under the National Environmental Management: Integrated Coastal Management Act.

Green hydrogen: The new kid on the green energy block and its potential environmental permitting requirements and challenges*...continued*

To ensure that Green Hydrogen's full potential can be achieved, impact assessment guidance documents such as those seen in respect of Renewable Energy Development Zones would be beneficial to supporting the development of this green energy resource.

The production of Green Hydrogen by way of electrolysis will likely require a water use licence in accordance with the National Water Act. The production of Green Hydrogen requires large volumes of water, and could trigger a number of water uses such as the abstraction and storage of water, and the disposal of waste or water containing waste. The design, layout and location of the development may also impede the flow of a water resource and impact or alter its beds, banks and characteristics.

The production and or use in manufacturing of ammonia is included under Subcategory 7.1 of the listed activities under the National Environmental Management: Air Quality Act (NEMAQA) and requires an atmospheric emissions licence. Specialist assessment will be required to determine whether Green Hydrogen triggers the same or other NEMAQA requirements.

The production, storage and handling of Green Hydrogen will be subject to the Occupational Health and Safety Act and more specifically a Green Hydrogen production plant will be required to register as a major hazardous installation in terms of the Hazardous Chemical Substances Regulations.

Over and above the material environmental permitting requirements that will be applicable, other ancillary but important permitting requirements will also be applicable relating to the transportation of dangerous goods and substances by road, as well as municipal bylaws.

As Green Hydrogen Technologies are further developed, close assessment of its environmental impacts and permitting will be vital to ensuring the successful integration of Green Hydrogen into South Africa's energy mix. Furthermore, how environmental permitting for Green Hydrogen production will affect existing renewable energy facilities and their associated environmental permits will need to be taken into consideration, with the recommendation that proposed renewable energy facilities possibly incorporate green hydrogen production into their environmental impact assessments now. To ensure that Green Hydrogen's full potential can be achieved, impact assessment guidance documents such as those seen in respect of Renewable Energy Development Zones would be beneficial to supporting the development of this green energy resource.

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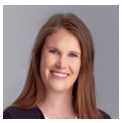

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Our BBBEE verification is one of several components of our transformation strategy and we continue to seek ways of improving it in a meaningful manner.

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