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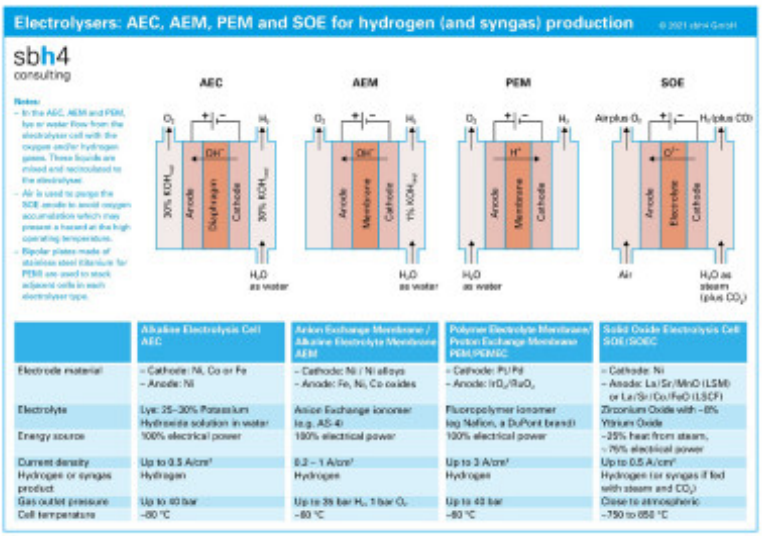

GREEN ENERGY *(/news/green-energy/42)*

Water for hydrogen electrolysis in Egypt and other desert locations

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The dominant path to green hydrogen is splitting water molecules using renewable electrical power on an electrolyser. The main source of renewable power generation globally at present is hydro power. Where electrolysers are used in proximity to a hydro dam, there will always be access to fresh water to create hydrogen.

However, the main ramp up in renewable power generation is from wind and solar power. The optimum location for wind power generation is often offshore, in salt water. The best places to generate low-cost solar power are generally in arid desert locations with limited access to fresh water.

Countries like Chile, Namibia and Oman stand out as excellent green hydrogen production locations. Western Australia and southwestern China are also blessed with ideal conditions for integrated wind and solar power generation. These locations have the potential to be the green hydrogen superpowers of the future. But looking at this list leaves us asking the question: how can we get abundant fresh water to these arid locations to feed the electrolysers?

The technologies that will bring fresh water to electrolysis schemes are exactly those that are relied on today to make potable water available in arid locations. Desalination is used extensively in the Middle East to make water available for the emerging vertical farming sector and coastal cities. Water tankers deliver fresh water to many villages in South Asia where families eagerly fill their portable water containers from hose pipes. Drilling for groundwater is common on every continent, except for the frozen Antarctic!

Whilst the technologies are known, the challenge related to making fresh water available for green hydrogen projects may be several multiples greater than has been faced up to now. Taking Inner Mongolia in China as an example, rapid electrolyser capacity expansion around major projects that are often backed by state owned enterprises will leverage the province's renewable power resources.

The world's first GW-scale green hydrogen project to be announced and taken through FID is sponsored by Air Products, ACWA Power and ENOWA, a subsidiary of NEOM. The scheme will use atmospheric pressure alkaline electrolysers to generate green hydrogen from integrated wind and solar power generation. Hydrogen will be converted to green ammonia for export.

The project will be implemented in north-western Saudi Arabia. This is an arid region on the eastern coast of the Red Sea, so the most viable option to obtain fresh water for the electrolysers will be desalination.

To support the project, the Japanese conglomerate Itochu which has energy and infrastructure interests, and the French utility company Veolia will build a desalination facility operated by renewable power. The plant will produce 500,000 cubic meters a day of water by early 2024. That equates to an annual production of 182 million cubic metres. It will serve the emerging smart city of NEOM and ENOWA's green hydrogen electrolysis project.

Egypt lies on the opposite shore of the Red Sea. During COP27, which will take place in Egypt, many Egyptian green hydrogen projects were showcased. The Suez Canal Economic Zone stretches from Port Said at the northern end of the Suez Canal to Al Sokhna at the Canal's southern tip. The zone has become a hub for green hydrogen projects with announcements from companies such as France's EDF Renewables (through the Green Fuel Alliance), Norway's Scatec, Australia's Fortesque Future Industries and India's Renew Power.

The Renew Power project will establish a USD 8 billion green hydrogen facility to serve export markets in addition to the local market. The first phase will produce 20,000 tonnes of green hydrogen and 100,000 tonnes of green ammonia per year by 2025.

When complete, the Renew Power scheme will produce eleven times the amount of hydrogen and ammonia that are planned for the first phase. That amount of hydrogen generation by electrolysis will require almost 2 million cubic metres of water per year. Fresh water from the Nile is required for other purposes such as crop irrigation and to serve population centres, which are built up along the banks of the river. Therefore, major desalination facilities will be required to support green hydrogen projects in the Suez Canal Economic Zone.