Hydrogen: MENA region going for green

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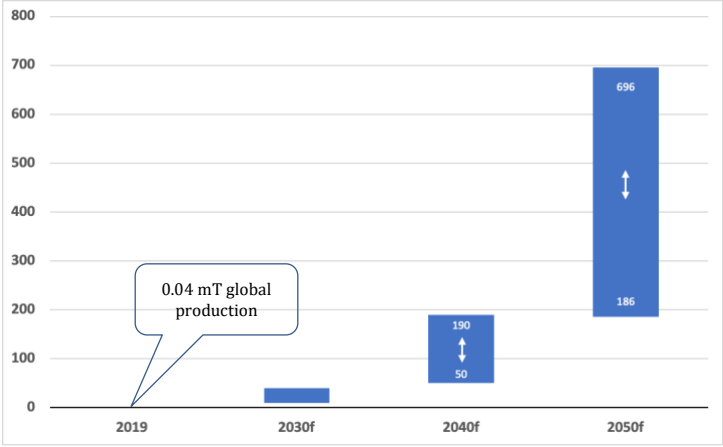
- **Hydrogen will play a key role in delivering a low-carbon future as the fuel's share in the energy marketplace looks set to grow six-fold by 2050.**
- **MENA countries wield geographical and logistical advantages that may yet enable the region to become a hydrogen energy market leader.**
- **Yet despite a plunge in the cost of hydrogen, expensive challenges remain when it comes to extracting the energy cleanly.**

Hydro-gentrifying

Hydrogen is an energy source which has thus far failed to establish itself in a mainstream manner. However, despite being a small market, hydrogen is gaining both political and commercial momentum. This growth is capturing the attention of key MENA players.

- Hydrogen fuel is still a relatively nascent phenomenon, and currently only captures 4% of the global energy mix. This figure is expected to jump six-fold, reaching 24% by 2050 (the world's target year for net-zero carbon emissions).
- The recent hype surrounding hydrogen is underscored by the urgency of climate change and the prioritisation of decarbonisation on the global political agenda.
    - However, extracting hydrogen (which is not a naturally occurring element) can be either dirty or clean. 'Grey' and 'blue' hydrogen are obtained through the use of hydrocarbons, while clean (or 'green') hydrogen is extracted through renewable energy input (such as wind or solar power).
    - Ambitions are high, but green hydrogen accounts for a paltry 0.1% of the total hydrogen currently produced globally.
- We expect electrification and renewable energy to continue to charge the decarbonisation momentum. Yet if the world is to achieve its goal of net-zero carbon emissions by 2050, these renewables alone will be insufficient to meet future demands.
- In an attempt to stay ahead of the curve, we are witnessing governments and private sector players around the world establishing pilot plants in order to produce hydrogen and secure a first-mover advantage.
    - There are plenty of prizes up for grabs; hydrogen revenues are expected to increase 17-fold from around USD 142B in 2019 to almost USD 2.5T by 2050.
- The EU (in particular Germany) is leading the expansion of the hydrogen energy market.
- The bloc aims to spend almost EUR 1T to achieve climate neutrality by 2050 under its European Green Deal.
    - Half of this investment will be directed towards green hydrogen.
- Under Germany's National Hydrogen Strategy, the country has committed almost EUR 7B to its hydrogen programme, which started last year and will continue until 2040.

Figure 1: Global green hydrogen demand projections (mT/annum)[1]



- We assess that the EU's aspirations for Europe to become the first zero-carbon continent will only be achieved with the supply of hydrogen from the MENA region, which enjoys a competitive advantage in supplying the low-to-zero carbon energy source.
- MENA oil exporters are both excited and concerned by the prospect of becoming hydrogen suppliers.
- They certainly want to reduce carbon emissions as part of the energy transition and wider global decarbonisation efforts.
    - Yet behind the buzz we perceive wary undertones. Some key players are worried they may lose their influence within future decarbonised energy markets.
- The MENA region enjoys multiple advantages that may facilitate the realisation of its ambitions to become a green hydrogen market leader. Among these perks are geography and logistics.
- An abundance of high-level solar and wind power throughout the year provides a streamlined supply of low-cost renewable electricity, an input needed for the extraction of green hydrogen.
    - Investments in renewable energy are growing rapidly throughout the region and have enjoyed a nine-fold increase in the past decade.
- The region's ample land space enables large-scale production capacity which is ideal for creating economies of scale.
- Governments in the region may also benefit from legacy infrastructure and existing expertise in exporting liquid fuels to develop an effective hydrogen export industry.
- We believe that the Gulf will invest heavily in green hydrogen throughout the next decade. However, in the medium term, we expect an increase in the production of grey and blue hydrogen (which emit carbon) as a means of laying the foundations for a hydrogen market.
- Everyone knows that the MENA region is brimming with vast hydrocarbon reserves which are needed to extract grey and blue hydrogen.
- Gulf states understand the threat posed by climate change; they know there is an urgent need to diversify their energy sources. This has led many MENA players to prepare for the extraction of clean, green hydrogen energy. Yet

[1] Arabia Monitor; IEA.

despite these ambitions, 'dirty' hydrogen will dominate the scene in the short term.

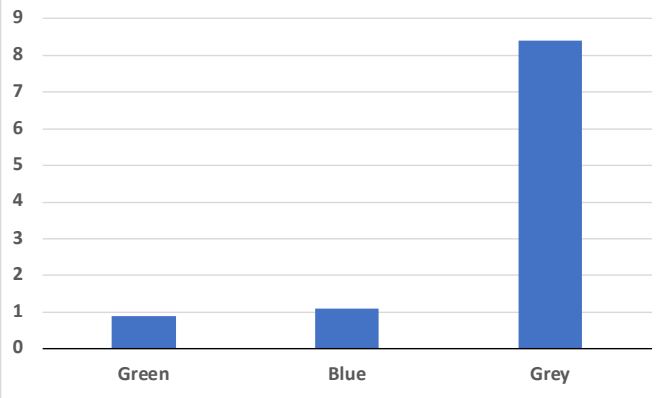
- Nevertheless, multiple projects aimed at benefiting the global energy picture are moving forward throughout the MENA region. Clean hydrogen is due to play its part.

Gulf states showing their colours

The MENA frontrunners of the hydrogen market are Saudi Arabia and the UAE. The UAE is currently in the lead, but its larger neighbour is certainly showing promise.

- Long known as a regional trendsetter, the UAE became the first green hydrogen producer in the region in May 2021 with the launch of its industrial-scale zero-carbon hydrogen facility.
  - We are not surprised by this move. The country has been far ahead of the curve when it comes to renewable energy.
    - The UAE owns 70% of the GCC's renewables capacity.
- The Khalifa Industrial Zone Abu Dhabi (KIZAD), a unit of the publicly owned Abu Dhabi Ports, announced in May 2020 that it plans to develop a green hydrogen and ammonia production facility which will have the capacity to produce around 40K tonnes of green hydrogen annually by 2026.
  - We regard this as a logical move by the UAE given its sizeable shipping industry. Ammonia (which can be made from hydrogen) is a clean fuel that is used in freight shipping and can help to decarbonise the sector.
- Although the UAE has made a significant statement by stepping up its green hydrogen credentials, we assess that it will specialise in blue hydrogen; the country can use its oil wells to enable the carbon-capture process needed to make blue hydrogen from hydrocarbons.
- Saudi Arabia has established itself as the other key MENA player in the growing hydrogen market.
  - As part of its Red Sea NEOM smart city project, the kingdom looks set to build the world's largest green hydrogen-based ammonia facility.
    - The project will cost around USD 5B and should be able to produce about 650 tonnes of green hydrogen per day (237K tonnes annually) by 2025, all the while saving an estimated 3M tonnes of CO2 annually.
  - Until NEOM materialises, Saudi Arabia needs to work on diversifying its energy market even further.
    - Before the COVID-19 pandemic, the kingdom shipped around USD 145B worth of crude exports in 2019. Conversely, it only managed to ship around USD 6M of hydrogen exports in that year.
- Quietly getting on with its own plans is Oman. Indeed, the sultanate's total energy mix is expected to comprise around 35% clean energy by 2050.
  - This ambition was underscored by the government's announcement in May 2021 of its plans to embark on a solar- and wind-powered project capable of producing millions of tonnes of zero-carbon green hydrogen per year. Once built, the project will be the largest of its kind in the world.

Figure 2: CO_2 emissions from multi-coloured hydrogen extraction (Kg of CO_2 / Kg of H_2) [2]



  - We view this as a calculated move by Oman. The sultanate will subsequently be able to capture considerable parts of the clean energy market by leveraging its favourable environmental conditions for green hydrogen production.
- Another country in the region benefitting from its natural resources is Qatar. Around 98% of hydrogen produced globally is grey (deriving from natural gas). Qatar, being saturated in liquefied natural gas (LNG), is the world's fifth largest grey hydrogen exporter (and the largest in the MENA region).
  - Although extracting grey hydrogen emits CO2, it is a sound way to develop the hydrogen market in the medium term. However, the production of green hydrogen should be the universal goal looking further ahead.

Costly to be climate-conscious

While hydrogen fuel offers significant benefits with regard to the global transition from fossil fuels, the industry must first overcome various hurdles.

- Despite the excitement surrounding green hydrogen, one major barrier precluding market expansion is cost.
  - The cost of the renewable energy input required to extract green hydrogen is relatively high compared to the use of hydrocarbons.
  - Nonetheless, the cost of renewables has dropped by about 50% in the past six years due to technological advances. This figure is expected to fall even further as research and development continues.
    - Indeed, the cost of green hydrogen is expected to drop from USD 5 per kg to USD 0.7 per kg by 2050.
  - Looking ahead, we believe that significant policy shifts and investments from MENA countries in renewables could aid price competitiveness with regard to clean hydrogen energy.
- Furthermore, we assess that for regional governments to impact the expansion of the hydrogen market in a positive manner, they must intervene and provide incentives through regulatory frameworks and public-private partnerships.

[2] Arabia Monitor; Qamar Energy.

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