COP 28 Ahead: Hydrogen Ambitions in MENA

MENA · 07.11.2023

During COP28, the fourth annual Hydrogen Transition Summit will be held to examine: (i) increasing hydrogen production; (ii) mobilising finance and de-risking investment for renewable and low-carbon hydrogen projects; (iii) policy frameworks to match global hydrogen supply and demand; and (iv) connecting the global supply chain.

Low-carbon hydrogen is seen as increasingly important for achieving the rise of national and international decarbonisation goals. In May 2023, the Hydrogen Council Insights report[1] noted that globally there has been 38 megatonnes per annum ("**MT p.a.**") of 'clean' hydrogen production announced by 2030 (approximately 25 MT p.a. of renewable hydrogen and 13 MT p.a. of low-carbon hydrogen). This 38 MT p.a. is roughly 50% of the 75 MT p.a. of renewable and low-carbon hydrogen that is required in 2030 to be on track for a global "net-zero by 2050" scenario.

Whilst the number of hydrogen production projects remain far below the level required (indicative of the challenges involved), it also points to the opportunities for early movers and the possibility of rapid expansion in this industry. Of the 12 MT p.a. supply projects added in the last eight months, approximately 10 MT p.a. are renewable hydrogen projects, driven by regions such as the Middle East and Africa.

Electrolytic hydrogen, also known as 'green hydrogen',[2] is projected to expand across the Middle East and North Africa ("**MENA**") region. In late 2022, MEED calculated that there were approximately 50+ known and planned green hydrogen and ammonia projects in the region, seeking investments of upwards of $150 billion.[3]

However, the opportunities for developing green hydrogen projects in the MENA region come with challenges. For example, its flat land offers both space for rapid expansion but also a lack of the significant amount of water required for such projects.

Opportunities and expansion:

The Gulf Cooperation Council ("**GCC**") nations are positioning themselves to take advantage of the rising demand for green hydrogen. The continued expansion of high yield renewable sources such as wind and solar, large areas of available land, and low domestic green hydrogen consumption due to cheap electricity/gas, combine to provide the opportunity for exports (*see graph below*).

Renewable energy production supporting green hydrogen

The construction of renewable energy projects has been a key aspect of sustainable initiatives for governments in the region. For example, the Kingdom of Saudi Arabia's ("**KSA**") national Vision 2030 is looking to reach 58.7 GW of renewable energy capacity by 2030. In UAE, the Mohammed Bin Rashid Al Maktoum Solar Park (the largest single-site IPP solar plant in the world) entered its sixth phase in August 2023, with this phase alone costing up to $1.5 billion.

A strong foundation of renewable energy production is essential for the viability of green hydrogen projects both with respect to settling investor uncertainties, and commercially to reduce green hydrogen costs as the year-round solar supplies of renewable energy also falls. The declining cost of renewable energy, combined with the increased renewable energy focus in the national strategies of MENA governments, offers some promise for green hydrogen in MENA.

On the other hand, high domestic energy consumption combined with minimal renewable energy generation means that, at least for now, users will continue to rely on more carbon-emitting hydrogen 'colours'.

National strategies and direct investment into green hydrogen

Investment directly into green hydrogen is also demonstrated in the MENA region. This year, KSA's NEOM Green Hydrogen Company entered into financial agreements with funders for the construction of an $8.4 billion green hydrogen plant, powered by solar and wind power. The security of its 30-year offtake agreement has been important for the achievement of financial close with the 23 banks and investment firms involved. The green hydrogen plant is aiming to first export green ammonia from Q1 2026 onwards.

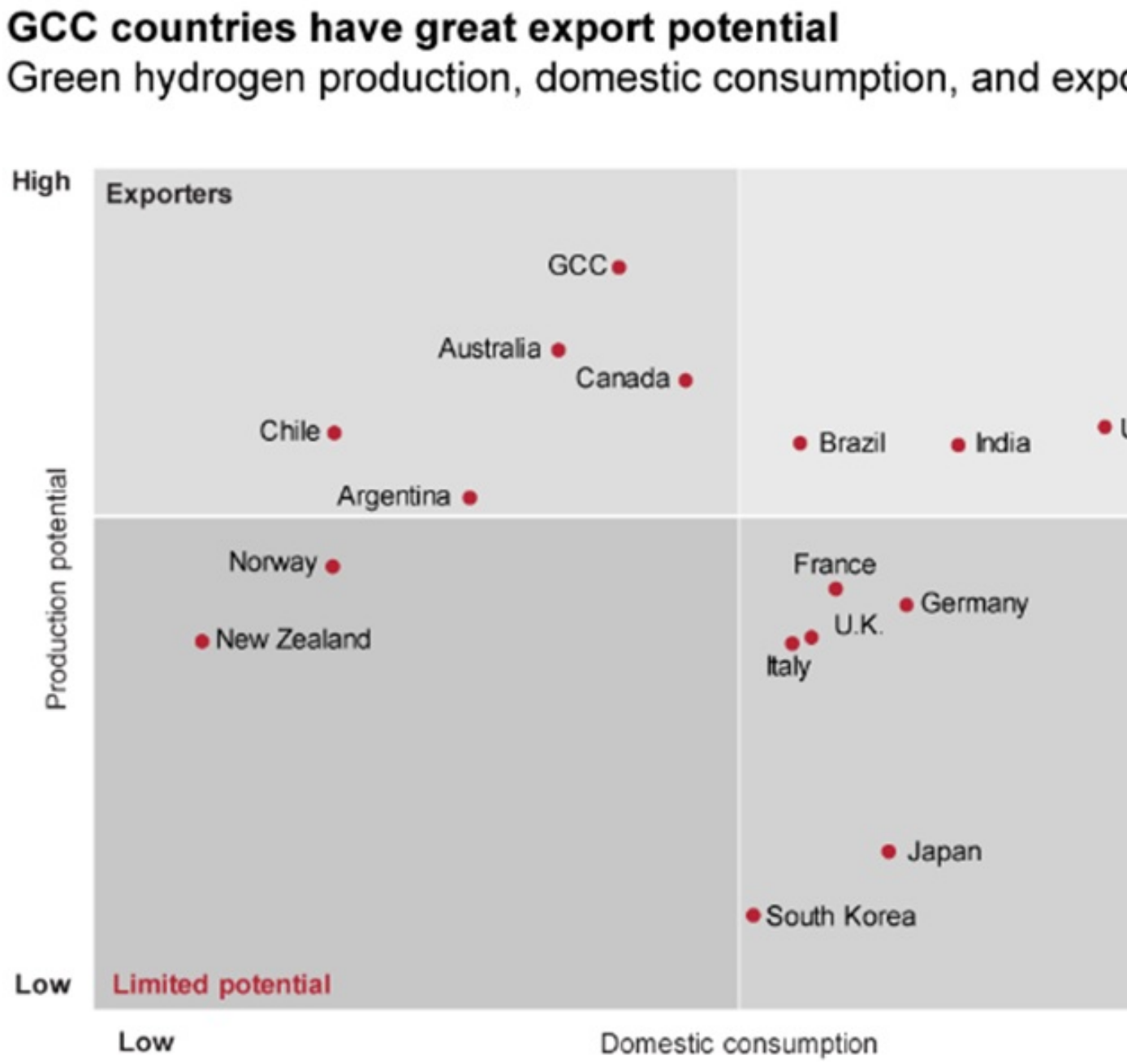
The International Renewable Energy Agency projects that hydrogen and its derivatives will be able to supply 12% of global energy needs by 2050. The UAE has targeted 25% of the worldwide hydrogen market and KSA intends to become the largest provider in the world.[4]

Countries in the region looking to take advantage of hydrogen demand include in particular, Oman and Egypt.

Oman committed to producing 1 MT p.a. of green hydrogen by 2030, increasing to 3.75 MT p.a. by 2040 and 8.5 MT p.a. by 2050. Oman established Hydrogen Oman ("**Hydrom**") as a subsidiary of the state-owned Energy Development Oman SOAC. In June 2023, Hydrom signed three agreements to develop the first green hydrogen blocks in the country; total investments are expected to top $20 billion with a total production capacity of 0.5 MT p.a. utilising over 11.5 GW of installed renewable energy capacity at the three sites.

In North Africa, in June 2023, Egypt published a green hydrogen production roadmap ahead of publishing its national strategy for green hydrogen. In late September 2023, the Egyptian Minister of Electricity and Renewable Energy noted that Egypt's upcoming national strategy intends to target up to 8% of the global tradable market in the hydrogen sector by 2040.

Egypt has launched both an Integrated Sustainable Energy Strategy 2035, which aims for 42% of national energy to be generated from renewable sources by 2035 and has a National Climate Change Strategy 2050. These green hydrogen ambitions are being financially supported. In COP27, held in Sharm El-Sheikh (Egypt), the government signed nine framework agreements with international power companies for the construction of green hydrogen and ammonia facilities in the Suez Canal Economic Zone. Collectively, these facilities look to produce up to 7.6 MT p.a. of green ammonia and 2.7 MT p.a. of green hydrogen, with all facilities targeting operational dates by 2035.[5]



Challenges:

Green hydrogen

Whilst the MENA region has unique advantages for the development of green hydrogen, it also faces specific issues. For example, it must concurrently take steps to mitigate constraints on freshwater supplies. Estimates suggest that the GCC countries will require 5.6 trillion litres of deionised water in order to meet 2050 levels of green hydrogen demand.[6]

On the production side, some of the challenges in the MENA region are similar to those faced in other jurisdictions, such as costs and need for infrastructure. Despite advances in electrolysis technology and lowering costs of producing renewable energy in the Middle East, green hydrogen remains significantly more expensive than grey hydrogen.[7] This is largely due to the cost of the renewable energy itself, the electrolysers and transportation. To overcome this issue of cost

competitiveness, purchasers of hydrogen are seeking incentives to engage, which can take the form of clear regulatory incentives across the MENA region, such as cost gap subsidies between producers and purchasers, or mandates obligating green hydrogen purchases.

On the demand side, the grant of capital or financing, such as by way of concessions, loans, and grants, may be required to bridge the funding gap to make green hydrogen projects more attractive to consumers used to cheaper grey hydrogen or other fuels. For example, options to close the gap between the price of green hydrogen production and offtaker purchase prices include expanding programmes equivalent to the recent European-focused H2Global instrument programme into the MENA region, or in the longer term the expansion of Contracts for Difference (CfDs) into hydrogen projects.

Tax credits may also be an option. Egypt approved a draft bill on 17th May 2023 in respect of tax incentives for companies involved in the "production, storage and export of green hydrogen." Companies are to receive a tax credit of between 33% and 55% on income earned from green hydrogen facilities.

Broader issues with hydrogen development

Noting the ambition to export hydrogen, the question of infrastructure is unavoidable. For a global green hydrogen sector to emerge, transportation will need to be addressed. Currently, the scale of shipping and ports is inadequate to support rapid expansion. To address this will require further inter-regional dependencies and cooperation. Manufacturing is additionally an issue, with manufacturing capacity for high GW projects lagging behind production capacity.

Compounding the issues of transportation between import points to centres of demand, hydrogen also often encounters problems with storage as its low-energy density means greater storage volume is required for the same energy values. It remains to be seen as to whether mid-stream value chain startups focusing on domestic transport, or new storage technologies, can assist in plugging this gap, each of which will be particularly significant due to the limited progress on hydrogen storage in the MENA region so far.

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[1] Hydrogen-Insights-2023.pdf (hydrogencouncil.com)

[2] Hydrogen has been classified by colours according to the way that it is produced. Whilst the molecules are indistinguishable, this categorisation assists for clarity. Blue hydrogen is generated from the same process as grey hydrogen. The distinction is that the carbon produced from steam reforming is captured and stored through carbon capture and storage ("**CCS**"). More on blue hydrogen and CCS can be found in the next article in this series: **here**.

[3] Smooth Transition – The Middle East can become the World's Green Hydrogen Hub (worldfutureenergysummit.com)

[4] MENA Green Hydrogen Market - Forecast to 2040 | Global Insight Services

[5] The dawn of green hydrogen | Strategy& Middle East (pwc.com)

[6] The dawn of green hydrogen | Strategy& Middle East (pwc.com)

[7] Grey hydrogen is the most common form of hydrogen. This is generated through steam reformation of natural gas or methane. Subsequently, the grey hydrogen production process does not emit significantly fewer emissions than black or brown hydrogen which each utilise fossil fuels (predominantly coal).

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