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## Investment Trends in MENA's Hydrogen Sector in 2023

Written by **Anna Vasileva**

Edited by **Ivan Shumkov**

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# Intelligence Report

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## Introduction

In 2023, countries in the Middle East and North Africa (MENA) region endeavoured to propel low-carbon hydrogen development, leveraging the region's vast potential and actively attracting projects while advancing strategic initiatives and policies. This joint commitment reached a crucial point with the efforts coming together at the COP28 summit held in Dubai at the end of the year.

According to a techno-economic assessment in the Hydrogen Council's Global Hydrogen Flows report, the MENA region possesses substantial hydrogen potential. The analysis indicates that the region could produce up to 1,088 million tonnes per annum of hydrogen in 2050, equivalent to 27% of the global hydrogen production potential. Despite certain constraints, the MENA region is anticipated to be a highly competitive player in low-carbon hydrogen production and exports.

Ambitions in the region are growing, with announced clean hydrogen investments through 2030 rising by 80% since January 2023 to reach USD 54 billion as of October 2023. This represents about 9.5% of the total USD 570 billion in announced global investments in hydrogen value chains expected by the end of this decade.

However, the progress in project implementation is slow, with only about 2 GW of the announced capacity in the region having reached the final investment decision (FID) phase. This constitutes around 15% of the total electrolysis capacity that has passed the FID globally, and it largely originates from a single giga-scale project in Saudi Arabia.

Challenging market conditions have led governments in the region, including Egypt and Morocco, to contemplate incentive packages to boost the industry and facilitate the progression of projects to the FID stage.

In terms of infrastructure, the region boasts well developed port and pipeline infrastructure thanks to its strong positions on the oil and gas export market and is taking steps to advance the development of the necessary infrastructure to become a major international player in the hydrogen industry. In 2023, the region accounted for 45% of global committed investments in hydrogen infrastructure amounting to about USD 6.5 billion, according to Hydrogen Council estimates.

## COP28 Announcements

The role of green and low-carbon hydrogen in decarbonisation was affirmed at the COP28 summit in Dubai with the launch of several initiatives – a declaration of intent on mutual recognition of certification schemes for hydrogen and its derivatives, a methodology for the assessment of greenhouse gas emissions (GHG) in hydrogen production pathways, and a public-private action statement on cross-border trade corridors.

- The Declaration of Intent on the Mutual Recognition of Certification Schemes for Renewable and Low-Carbon Hydrogen and Hydrogen Derivatives was signed by more than 30 nations, representing a significant step toward overcoming a key obstacle to developing cross-border hydrogen trade – certification.



*COP President Sultan Al Jaber  
Source: COP28 UAE on LinkedIn*

The declaration reads that its signatories will work towards mutual recognition of their respective certification schemes for renewable and low-carbon hydrogen and its derivatives and develop relevant solutions for mutual recognition of such schemes.

The declaration will cover more than 80% of the future global market.

The signatories include many of the countries in the region aspiring to become major hydrogen players such as COP28 host the UAE, Egypt, Oman, and Morocco as well as other countries such as the US, Germany, Japan, Australia, Brazil, the UK.

- The public-private action statement on cross-border trade corridors was agreed in partnership with the International Hydrogen Trade Forum (IHTF) and Hydrogen Council. The collaboration will concentrate on joint initiatives to examine developing cross-border trade routes for hydrogen and its derivatives and provides for public-private partnerships to speed up the rollout of clean energy. Australia, Germany, Canada, France, Singapore, the UK and the US are among the participating nations.

- A Collective Agreement on the responsible renewables-based hydrogen is an expression of the need for a range of principles and standards to ensure that the deployment of green hydrogen is both climate positive and puts people and the planet at the forefront of hydrogen-related development. The agreement outlines six themes that should guide responsible deployment.
- An ISO methodology was released, establishing a worldwide standard for evaluating greenhouse gas emissions in hydrogen pathways throughout their life cycle, encompassing all stages. The document includes methodologies applicable for calculating the carbon footprint of a product (CFP) or a partial CFP for a hydrogen product, aligning with ISO 14067.

## UAE

The COP28 host published its hydrogen strategy in November ahead of the climate summit. The document, prepared by the Fraunhofer Cluster of Excellence Integrated Energy Systems (CINES) and consulting firm GHD Advisory, includes measures meant to boost investment in the hydrogen industry and make the UAE one of the world's leading low-carbon hydrogen producers. By 2031, the Arab nation aims to generate 1.4 million tonnes of low-carbon hydrogen, employing various production methods such as blue, green, and pink hydrogen technologies. For green hydrogen production, the UAE will rely on the PEM technology.

Under favourable market conditions, the anticipated sectoral demand in the domestic market is projected to reach 2.1 million tonnes annually by 2031, accompanied by an additional export potential of 0.6 million tonnes per year.

Driven by escalating decarbonisation initiatives, the UAE's low-carbon hydrogen production capacity could surge to 7.5 million tonnes per year by 2040 and nearly double to almost 15 million tonnes by 2050.

The table below provides more details about the planned production capacity and its colour mix.

Year	2040			2050		
	Green	Blue	Pink	Green	Blue	Pink
Share of hydrogen supplied [%]	45%	50%	5%	47.5%	47.5%	5%
Hydrogen quantity supplied [mtpa]	3.37	3.75	0.37	7.07	7.07	0.74
Hydrogen electrolysis capacity required [GW <sub>H2</sub> ]	55.12	-	1.7	83.2	-	3.0
Electricity generation capacity [GW <sub>el</sub> ]	97.28	-	1.7	208.3	-	3.3
Natural gas required [MMscf]	-	511,548.3	-	-	936,632.9	-
Land (km <sup>2</sup> )	~ 633.6			~ 1,322		

Source: National Hydrogen Strategy, UAE

Under the strategy, the domestic hydrogen industry will be catalysed by the creation of hydrogen hubs – the so called hydrogen oases. These hubs will support demand creation as they are planned to co-locate both production and end-use applications in clusters. This approach is expected to eliminate network barriers and offer commercial opportunities for testing and validating technologies.

The hydrogen produced in the UAE is intended for both export and local use. The low-carbon molecules will be a key instrument in decarbonising the UAE’s hard-to-abate sectors such as heavy industry, long-haul transport, aviation, and shipping and achieving net-zero by 2050.

The government plans to employ policy and financial instruments to stimulate the demand for low-carbon hydrogen in the region, facilitating industrial decarbonisation and encouraging the trade of green products.

In 2031, the steel and iron sector is expected to be the largest consumer of low-carbon hydrogen in the UAE, accounting for 0.6 million tonnes per year, followed by the shipping industry with 0.5 million tonnes. By 2040, shipping is projected to take the lead with 1.7 million tonnes, followed by iron and steel with 0.9 million tonnes.

In addition, the UAE is dedicated to formulating policy frameworks to foster hydrogen industry expansion, collaborating with regional counterparts to stimulate the hydrogen market, and investing in Research and Development (R&D) to enhance the efficiency and cost-effectiveness of hydrogen implementation.

To build the hydrogen value chain, Abu Dhabi National Oil Company (ADNOC), an early mover in clean hydrogen production, and Abu Dhabi-based Strata Manufacturing agreed in 2023 to collaborate with Belgian mechanical engineering company John Cockerill to jointly produce electrolyzers in the UAE.

UAE's key hydrogen players, ADNOC and Masdar, bolstered their dedication to the low-carbon hydrogen sector at the COP28 conference, introducing several hydrogen initiatives, some aimed at markets beyond the Middle East.

Abu Dhabi-based renewables developer Masdar, which aims to produce 1 million tonnes of green hydrogen by 2030, forged an alliance with Spain's Iberdrola SA to jointly invest up to EUR 15 billion in the development of offshore wind and green hydrogen projects in the US, Germany and the UK. The partners are already looking to identify potential new opportunities.

The UAE developer entered two more deals on the sidelines of COP28 with two Austrian groups. A deal with energy group Verbund AG involves studying the feasibility of setting up a large-scale green hydrogen plant in Spain's Castilla-La Mancha region where Masdar is planning to install a solar park. The second partnership was agreed with Vienna-based oil and gas major OMV. As part of it, Masdar will explore the possibility of using green hydrogen to decarbonise industrial processes in the Austrian oil company's refineries.

A fourth project disclosed by Masdar at COP28 envisages a feasibility study for a large-scale green hydrogen project in Jordan.

Additionally, Masdar and Paris-based hydrogen investor Hy24 will partner on extensive green hydrogen projects in key global hubs across Europe, the Americas, Asia Pacific, and the MENA. During COP28 in Dubai, the companies formalised their collaboration through a strategic framework agreement, aiming to pursue co-development and co-investment opportunities throughout the Power-to-X value chain. This includes projects related to the production of renewable power, green hydrogen, and its derivatives such as green ammonia, e-methanol, sustainable aviation fuel, and liquid hydrogen.

As part of the collaboration, Masdar is anticipated to gain access to EUR 2 billion in co-investment and co-development opportunities over the next five years through the Clean Hydrogen Infrastructure Fund managed by Hy24.

As for ADNOC, the oil company agreed with Mitsubishi Heavy Industries, Ltd. to explore potential opportunities to build low-carbon energy supply chains.

## Oman

According to a recent report from the International Energy Agency (IEA), Oman has the potential to position itself as the sixth-largest global exporter of hydrogen by the end of this decade. The Sultanate benefits from favourable conditions for green hydrogen production and export, including abundant solar and wind resources, vast areas suitable for large-scale projects, existing infrastructure, and a strategic location with access to import markets such as Europe and Japan. The cost of producing green hydrogen within the country is expected to decrease to USD 1.6 per kilogram.

In October 2022, Oman introduced its green hydrogen strategy, aiming to produce 1 million to 1.25 million tonnes annually by 2030 to fulfill domestic needs and for export. By 2050, the production capacity is projected to expand to a range between 7.5 million and 8.5 million tonnes per year.

A crucial component of this strategy is the auction system under which land blocks are awarded to interested developers for the construction of green hydrogen production plants. In 2023, Oman successfully concluded the first round of the tender, securing five agreements with consortia composed of both local and international investors, totalling a combined investment of USD 30 billion. The land blocks awarded in the inaugural round are located in the Duqm area and aim to ensure that Oman reaches its 2030 goal.



The projects awarded in the first round of the auction are presented in the table below.

Developer	Location	Project Description
Amnah consortium (Copenhagen Infrastructure Partners, Blue Power Partners and Al Khadra)	Block Z1-01	200,000 tonnes per year of green hydrogen from 4.5 GW of renewable energy capacity, for planned green steel plants located in the port of Duqm
bp Oman	Block Z1-03	150,000 tonnes per year of green hydrogen from 3.5 GW of renewables capacity
Green Energy Oman (GEO) (OQ, Shell Oman, EnerTech, InterContinental Energy and Golden Wellspring Wealth for Trading)	Block Z1-04	150,000 tonnes per year of green hydrogen from 4 GW of renewables capacity
Engie, POSCO Holdings, MESCAT Middle East DMCC, Samsung Engineering Co. Ltd., Futuretech Energy Ventures, Korea East-West Power Co. Ltd. and Korea Southern Power Co. Ltd	Al Wusta Governorate	200,000-220,000 tonnes of hydrogen from 5 GW of wind and solar energy. This clean energy production is primarily intended for export in the form of ammonia. Investment value of USD 7 billion - 8 billion
DEME, OQ	Duqm free zone	first phase of a project that is being prepared for some time and aims to produce about 50,000 tonnes of hydrogen and ammonia

Hydrogen to be produced in the Sultanate is intended not only for export purposes but also for domestic use. The nation's largest steel manufacturer Jindal Shadeed Group has already broken ground on a green steel plant in the Duqm area which is expected to go online in 2026.

The facility will cost more than OMR 1.3 billion (USD 3.3bn) and will be powered entirely by renewable energy and green hydrogen. It is planned to have the capacity to produce some 6 million tonnes of steel annually.

In June, Hydrom opened the second round of the auction which aims to award up to three land blocks in the Dhofar region by the end of the first quarter of 2024.

In terms of infrastructure, Oman possesses an extensive natural gas network, encompassing around 4,000 km of pipelines that interconnect crucial locations such as the ports of Salalah, Sohar, and Sur. The country has an operational LNG export terminal near Sur and another one is planned to be built in Sohar to be powered by solar electricity.

The existing fossil fuel infrastructure enables Oman to exports about 0.2 million tonnes of ammonia per year, but it will not be capable of facilitating the exports projected in the National Hydrogen Strategy without building more facilities. According to IEA, the country's capacity to export ammonia has to be expanded 20 or 30 times, adding more export infrastructure such as storage tanks and dedicated deepwater jetties. The development of such facilities has to start in the next few years so that they can be utilised by the end of this decade.

OQ gas networks (OQGN), the sole operator of Oman's gas pipeline system, aims to repurpose the existing infrastructure to facilitate hydrogen transportation. In June 2023, OQGN and Hydrom launched an initiative to explore the development of a green hydrogen network infrastructure in the Sultanate in an effort to create an efficient and cost-effective solution for green hydrogen transportation.

Hafsa Al-Subhi, Hydrom's planning manager, said in September 2023 that Oman is planning a 2,000 km network of hydrogen pipelines throughout the country to advance its massive green hydrogen initiatives. The proposed network is designed to initially supply green hydrogen to three industrial zones – Duqm, Al-Jazir, and Salalah. The initial phase involves connecting Duqm and Al-Jazir, with Salalah in the south to be integrated at a later stage. The ultimate goal for the network is to extend to the capital Muscat in the north by 2050.



*Discussions on the development of a liquid hydrogen supply corridor to Europe. Image by Hydrom*

Logistical preparations are also underway for the export of hydrogen to Europe. On the sidelines of COP28, Hydrom and Oman’s Ministry of Energy and Minerals agreed with several Dutch companies to study the development of a liquid hydrogen supply corridor to facilitate the export of green hydrogen from the Sultanate

to the Port of Amsterdam and further to Europe. In addition to the Port of Amsterdam, the partners on the Dutch side include Zenith Energy Terminals and GasLog.

The scope of the study involves evaluation of the essential prerequisites for establishing an open-access hydrogen liquefaction, storage, and export facility in Oman. The collaboration includes the use of specialised vessels developed by GasLog, which will transport liquid hydrogen to Zenith Energy's terminal in Amsterdam. At this terminal, the liquid hydrogen will undergo regasification, and the resulting hydrogen will be distributed to local users within the port and major industrial customers in Europe.

## Saudi Arabia

Saudi Arabia, one of the world’s top oil producers, still does not have a national hydrogen strategy but the Kingdom has repeatedly expressed its ambitions to become a major hydrogen exporter.

The Tabuk province in the northwest is home to the 2.2 GW Neom green hydrogen project.



*Map by ACWA Power*

A major milestone for the green hydrogen sector in the region was achieved in May 2023 when the project became the first gigawatt-scale green hydrogen scheme to reach FID. The companies behind it -- Saudi Neom Green Hydrogen Company (NGHC), ACWA Power and US industrial gases company Air Products, signed agreements with 23 local, regional, and international banks, and investment firms, securing USD 6.1 billion in non-recourse financing. They completed the financing of the project at a total investment value of USD 8.4 billion.

The construction of the plant is currently underway in Oxagon, in northwestern Saudi Arabia. The engineering, procurement, and construction (EPC) agreements with Air Products for this extensive project total USD 6.7 billion.

The plant will be equipped with Thyssenkrupp Nucera's electrolysis technology which is based on 20 MW alkaline water electrolysis modules.

In June, China's Envision Energy was contracted to supply 1.67 GW of wind turbines which should power the production of green hydrogen at the mega plant. The first batch of the 171-6.5 MW wind turbines arrived at the Port of Neom in November.

Equipment procurement has further advanced with the selection of GE Grid Solutions as a supplier of substations for the project. The US company will deliver 380 kV T155 gas-insulated substations to ensure uninterrupted operation at the hydrogen plant and the wind and photovoltaic plants, which will power the electrolyser.

In addition to the flagship Neom project, some other green hydrogen alliances emerged in 2023. One of the major players on the local green hydrogen scene, Riyadh-based ACWA Power, teamed up with Austrian utility Verbund AG to explore the development of green hydrogen projects in the Middle East with the aim of producing and supplying the clean fuel to Austria and Central Europe.

The two companies signed a memorandum of understanding (MoU) during the Abu Dhabi Sustainability Week (ADSW) 2023 in January.

The Saudi developer is also partnering with several Dutch companies -- the Port of Amsterdam, hydrogen terminal operator Zenith Energy Terminals and LNG shipping service provider GasLog, on a feasibility study that should assess the viability of establishing a corridor to export liquefied green hydrogen from ACWA Power's production sites to the port of Amsterdam.

Saudi Arabia's Public Investment Fund (PIF) got involved in two partnerships with international companies that target green hydrogen production locally. The first one, disclosed in March, was with Marubeni Corp from Japan and concerns the exploration of options for green hydrogen production in Saudi Arabia. The second partnership is with French utility Engie SA and involves joint work on projects for the production of green hydrogen and its derivatives for export.

In addition to its export aspirations, Saudi Arabia has joined the list of countries testing the application of hydrogen in the mobility industry. In September 2023, the Saudi Railway Company (SAR) agreed with France's Alstom to develop hydrogen train solutions adapted for Saudi Arabia. Under the memorandum, the two companies will explore hydrogen powered trains for the Kingdom.

In terms of the necessary infrastructure, the development of the hydrogen industry can benefit from the existing oil and gas infrastructure. The Kingdom has two free trade zones, industrial hubs, ten ports, a developed oil and gas network and production infrastructure which need to be adjusted to be capable of serving the hydrogen economy.

## Egypt

The rise of green hydrogen in Egypt is gaining traction, with the government anticipating foreign direct investments in these projects to reach around USD 81.6 billion by 2035. Since COP27 in Sharm El-Sheikh at the end of 2022, Egypt has taken firm steps to advance and support the emerging green hydrogen sector as it seeks to grab 8% of the global market by 2050.

The Arab country's renewable energy resources and its strategic location and proximity to Europe has attracted a number of international developers that have ambitions to produce renewable hydrogen and its derivatives locally. As many as 29 memoranda of understanding were signed recently and nine of them were followed by framework agreements for green hydrogen projects within the Suez Canal Economic Zone (SCZone), totalling USD 85 billion in investments.

The majority of green hydrogen proposals in Egypt are strategically concentrated in the SCZone. This location is favoured for its proximity to the Suez Canal, a crucial trade route through which a considerable portion of all global container traffic transits.

SCZone features six ports and encompasses 461 square kilometres across four industrial parks, which house facilities for ammonia, pharmaceutical, and

petrochemical production. Additionally, its proximity to the El Zaafarna wind farm and planned wind farms in the Gulf of Suez further enhances its strategic positioning.

The location is important also in terms of water supply. Due to the water scarcity in Egypt, green hydrogen production will have to be supported by desalinated seawater.

After the flurry of projects announced during COP27, Egypt has attracted more international investors in the course of 2023 and during COP28 in Dubai which unveiled proposals mostly focused on the production of green methanol for the shipping industry.

In October, C2X, the newly established subsidiary of shipping major AP Moller-Maersk A/S, announced a plan to build a green methanol plant in the SCZone. The initial stage of the initiative involves an investment of USD 3 billion and targets an annual production capacity of 300,000 tonnes of green fuel, leveraging the strategic location of the Suez Canal to meet the demand for ship supplies. In its ultimate phase, the plant aspires to achieve an annual production of one million tonnes of green methanol.

C2X was formed in September 2022 to invest in large-scale green methanol production facilities to supply customers in the chemicals and shipping sectors, including Maersk. The shipping major, which is betting on methanol for the decarbonisation of its fleet, expects to take delivery of its first ocean-going methanol-enabled vessel in the first quarter of 2024.

During COP28, renewables developer Scatec strengthened its commitment to the green hydrogen sector in the country with a USD 1.1 billion investment in a new green methanol facility near the Suez Canal. The Norwegian company, which is involved in Africa's first and largest PEM electrolyser in operation in Egypt, is planning to set up a plant to produce 100,000 tonnes of green methanol per year to cater to ships passing the Suez Canal.

The project involves a 190-MW electrolysis plant which will be powered by 317 MW of wind and 140 MW of solar energy. A MoU signed with the SCZone is aimed at issuing a licence to practice the activity of ships' bunkering with green fuel.

Apart from that, Scatec joined forces in May 2023 with Alexandria National Refining and Petrochemical Company (ANRPC) to develop a USD 450 million green methanol project in the port of Damietta to supply the shipping industry. The initial capacity of the facility will be around 40,000 tonnes of green

methanol annually with a potential for future expansion to 200,000 tonnes per year. The project includes the installation of a minimum of 40 MW of solar plants and 120 MW of wind farms to power a 60-MW electrolyser for green hydrogen production. Additionally, plans involve the construction of a seawater desalination plant and facilities for methanol production and storage.

In 2023, progress has been achieved on major projects in the SCZone with the signing of framework agreements with industrial group China Energy International Group and ACWA Power. The Chinese investor plans to spend USD 6.75 billion on a project aimed at the production of 1.2 million tonnes of green ammonia and 210,000 tonnes of green hydrogen annually. The new capacity will be built on an area of 500,000 square metres in the Sokhna industrial zone.

The framework agreement with ACWA Power details the development of the first phase of a proposal, featuring a capacity of 600,000 tonnes per year of green ammonia. The initial phase will be supported by an investment exceeding USD 4 billion. The intention is to scale up to a second phase with a potential capacity of 2 million tonnes per year.

In addition to deploying green hydrogen production capacity, Egypt is seeking to localise the production of electrolysers. China's PERIC, which manufactures both alkaline and PEM hydrogen generators, agreed with industry association Hydrogen Egypt to establish a facility in Egypt for the production and assembly of parts for electrolysers in the first quarter of 2024. According to a report by newspaper Asharq Al-Awsat, PERIC has entered into agreements to provide equipment to international companies that had previously secured hydrogen production projects with the Egyptian government. The total value of these supply deals is reportedly in the range of USD 200 million to USD 300 million.

To facilitate the implementation of these ambitious projects, the Egyptian government focused its efforts in 2023 on drafting legislation that introduces both tax and non-tax incentives for the production of green hydrogen and its derivatives. The proposed legislation was approved by the parliament on January 2, 2024.

The law is designed to provide incentives, exemptions, and guarantees to establish favourable investment environment and encourage investors who have already committed to green hydrogen production through memoranda of understanding and framework agreements to advance the implementation of their projects.

Incentives will be granted to projects targeting the production, storage, transportation or distribution of green hydrogen and its derivatives. In addition to electrolysis plants, such projects should involve also water desalination and renewable energy facilities. Projects focused on manufacturing equipment for the production of green hydrogen and its derivatives will also be eligible for the support.

The primary incentive specified in the law ranges from 33% to 55% of the tax paid, declared on the project's direct activity-generated income. Additionally, the legislation grants an exemption from value-added tax for equipment, tools, machines, raw materials, and transportation means, excluding passenger cars. For project expansions to qualify for the incentive, their expansion agreements must be finalised within seven years from the launch of the plant's commercial operation.

In addition, the Egyptian Cabinet approved in August 2023 a draft law that stipulates the creation of the National Council for Green Hydrogen and its Derivatives. The objective is to further promote investments in green hydrogen and help projects reach FID. The Council will monitor the implementation of the national hydrogen strategy, and propose amendments, policies and tools to reach the goals in it.

## Morocco

Morocco is aiming to become a significant green hydrogen producer and exporter, anticipating a demand of around 30 TWh by 2030, with about one-third allocated for exports. Domestically, the highest demand is expected in the industry sector (3.1 TWh by 2030) and transportation (0.5 TWh by 2030). The Moroccan Agency for Sustainable Energy (Masen), in partnership with the state-owned fertiliser company OCP. They are supported by the Institute for Research in Solar Energy and New Energies (IRESEN) and the GreenH2 Cluster is leading efforts to advance the green hydrogen industry in the country. The nation is ready to accelerate infrastructure development and actively seeks foreign investments.

To make the location more attractive and help the interested developers advance their proposed projects, the King of Morocco, Mohammed VI, commissioned the government in November 2022 to devise a policy which should provide certain incentives to support the industry. Details about the planned measures are yet to be disclosed but the package is expected to include financial, tax, and real estate incentives to investors. In September, Prime Minister Aziz Akhannouch said that the policy should be introduced in 2024.



The attractiveness of the local market has been proven by two massive initiatives announced in recent months, involving both local and international investors. Morocco-based Falcon Capital Dakhla and French hydrogen energy promoter Hydrogene de France SA intend to develop an 8-GW green hydrogen project in the Dakhla region of southern Morocco. The electrolysis plant, slated for commissioning in 2028, will be powered by 10 GW of wind and 7 GW of solar PV energy.

The initial investment in the project, dubbed White Dunes, is estimated at some USD 2 billion.

According to HDF Energy, the aim is to create a hub where “some of the world’s cheapest green hydrogen” will be produced.

The second proposal comes from the local subsidiary of UAE-based TAQA. TAQA Morocco is planning to invest about USD 10 billion in a 6 GW green hydrogen project, according to a report by newspaper Asharq, citing officials from the company and the Ministry of Investment. A TAQA official told the paper at end-December 2023 that a land plot of 70,000 hectares has been acquired in the Dakhla-Oued Eddahab region in southern Morocco to build the complex.

However, the realisation of this proposal as well as the advancement of ambitious projects such as CWP Global’s AMUN and TotalEnergies’ USD 10 billion green hydrogen and ammonia investment, largely depends on what kind of incentives the government will grant.

The progress of the industry should be helped also by the plan of Belgian mechanical engineering company and alkaline electrolyser specialist John Cockerill to set up a gigafactory for the production of electrolysers in Morocco. The factory will be built through a joint venture with an unnamed “leading Moroccan energy company”. The facility, touted as the first of its kind in Africa, will produce high-powered alkaline electrolysers of above 5 MW.

When it comes to preparations for exports to Europe, US-based developer CWP Global and Germany’s Hydrogenious LOHC Technologies said in May they would explore the feasibility of exporting green hydrogen produced in Morocco to Europe. The partners will study the potential export of 500 tonnes of green hydrogen per day by using Hydrogenious’ liquid organic hydrogen carriers (LOHC) technology. The starting point of the study will be the AMUN hydrogen project near the city of Tan which is planned to be powered by 15 GW of wind and solar capacity.

Morocco is enhancing its port infrastructure, specifically at Tanger Med, Nador West Med, and Dakhla, to enable the export of hydrogen. The country has a strategic advantage in hydrogen exports, given its connection to Europe through the Maghreb-Europe gas pipeline, which is a key component of the European Hydrogen Backbone.



*The SouthH2 Corridor.*

*Source: Snam*

The potential export of green hydrogen from North Africa to Europe is becoming more tangible with the initiative of Italy, Austria and Germany, announced in May 2023, to support the development of a 3,300 km hydrogen corridor between the two continents. Dubbed SouthH2 Corridor, the pipeline will enable the import of more than 4 million tonnes of green hydrogen per year from North Africa to demand clusters in Italy, Austria and Germany as early as 2030. The majority of the pipeline will utilise repurposed midstream infrastructure for hydrogen transport, supplemented by the construction of new infrastructure where needed.

The initiative is supported by producers committed to generating about 2.5 million tonnes of renewable hydrogen per year.

## Jordan

In the lead-up to and during the COP28 summit, Jordan reiterated its dedication to green hydrogen, aligning itself with fellow nations in the region.

Energy Minister Saleh Al-Kharabsheh in November said that a roadmap for green hydrogen has been crafted. Its aim is to leverage the existing natural gas infrastructure and renewable energy sources in order to establish Jordan as a regional green energy hub. Following this roadmap, the country will develop a comprehensive strategy that outlines opportunities, applications, and the legal framework and regulations for the production, utilisation, and export of green hydrogen.

The Jordanian government is also seeking to identify the infrastructure crucial for large-scale green hydrogen projects within the country. This initiative is intended to enhance attractiveness and cost competitiveness, drawing interest from international investors and developers keen on investing in green hydrogen and ammonia projects in Jordan.

Al-Kharabsheh had consistently communicated the Kingdom's desire to establish itself as a regional green hydrogen hub over the past two years. However, it was only in the last few months of 2023, reaching its culmination at COP, that tangible plans for large-scale projects were officially disclosed.

The energy ministry signed a total of 13 memoranda of understanding with domestic and international developers for feasibility studies with the objective to establish production facilities for green hydrogen and ammonia across the country. Five of these pacts were announced on the sidelines of the summit in Dubai. UAE-based Ocior Energy will explore the establishment of a facility capable of generating 1 million tonnes of green ammonia annually. The project will be executed in phases, with the ultimate objective of achieving 1 million tonnes slated for realisation by the year 2030.

A collaborative effort between KEPCO and Xenel envisions the production of 1 million tonnes of green ammonia from hydrogen.

The region's key renewables investors -- ACWA Power and Masdar are also among the companies vying to spearhead the green hydrogen industry in Jordan. The Riyadh-based developer will conduct preliminary feasibility studies for the creation of a green ammonia plant with an annual capacity ranging from 100,000 to 150,000 tonnes, while Masdar is set to conduct a feasibility study for a green hydrogen plant near the Port of Aqaba. The project aims to produce up to 50,000 tonnes of hydrogen annually using desalinated seawater and renewable energy.

Catalyst Investment Management Jordan is the fifth company to ink a pact for a green hydrogen project in the Hashemite kingdom. The company will study a project to produce 150,000 tonnes of green ammonia.

The five initiatives were preceded by eight other memoranda. A local company that plans to enter the nascent industry is Mass Group Holding (MGH) which already operates a 100-MW wind farm and is considering the development of projects across the country targeting the production of 180,000 tonnes of green ammonia annually.

Other local companies include Kawar Energy and Philadelphia Solar whose plans involve setting up sites with a capacity to produce up to 300,000 tonnes of green ammonia per year.

Among international investors assessing green hydrogen possibilities in Jordan are Germany's Enertrag, Poland's Hynfra and Amarengo MENA.

Under the MoUs with the Jordanian government, all these companies will conduct preliminary studies and depending on the results, the ministry will enter into framework agreements leading to final investment agreements for the projects.

## Conclusion

The MENA region boasts strategic advantages for renewable hydrogen exports, leveraging abundant renewable energy resources and existing gas pipelines between North Africa and Europe, along with ports located near vital areas like the Strait of Gibraltar, the Suez Canal, and the Strait of Hormuz.

Moreover, the industry receives robust government backing as local nations aim to establish a significant presence in the future energy markets.

Despite persistent challenges and slow progress in project implementation, the region is addressing obstacles by actively participating in trade corridor agreements and certification initiatives, as seen at the COP28 in Dubai.

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