WEALTH

Newsletter issued by the Ministry of Energy and Minerals in collaboration with Oman Observer
December 2022

Sultanate of Oman
The future of green energy

GREEN HYDROGEN SUMMIT OMAN

قمة الهيدروجين الأخضر

The Green Hydrogen Summit, sponsored by the Ministry of Energy and Minerals, aligns with the Sultanate of Oman's plans for an energy transition aimed at reducing carbon emissions, striking a balance between sustainable development and mitigating the impacts of climate change, utilizing clean technology, and diversifying energy sources. This summit is in line with the steps taken under the royal directives to claim zero carbon neutrality by 2050 and the development of the Oman Sustainability Center. The GHSO also takes place after the launch of the Sultanate of Oman›s national strategy for the gradual transition to the zero-carbon future, the national environmental energy strategy, and the pre-qualification stage for investors wishing to take part in the first round of investment opportunities in green hydrogen production projects through «Hydrom» platform, which was launched in November.

Themes

- Green Hydrogen Economy & Strategy
- Investments and Financing
- Green Hydrogen Projects Financing & Bankability
- Oman as a Green Hydrogen Hub
- Green Hydrogen Supply Chain
- Global Green Hydrogen Industry Review & Experiences
- Technological Development of the Green Hydrogen Value Chain

December 2022 **5 – 7**

Oman Convention & Exhibition Centre

+80 International Speakers

12 Discussion panels

+ 30 Exhibitors

6 Technical workshops

+2000 attendees

Energy Executive Circle (Exclusive Event)

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Ministry of Energy and Minerals

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Towards global leadership **in green hydrogen production**

His Excellency Eng. Salim Al-Aufi
Minister of Energy and Minerals

In the Sultanate of Oman, we aspire to be a worldwide hub for the production of green hydrogen, relying on the availability of the major elements for its production, which are essentially solar energy, wind energy, broad lands, and human cadres. The Sultanate of Oman›s experience in energy production and export, as well as its location in global markets and trade routes, contribute to its status as a pioneer in this industry. Furthermore, Oman›s global international connections will enable it to accomplish its strategic goals and objectives of becoming a significant global beacon for the production and export of green hydrogen.

To keep up with global initiatives to reduce carbon emissions, the Ministry of Energy and Minerals collaborated with its partners in OQ and Hydrogen Oman (Hydrom) to take preliminary steps to expedite the procedures for regulating the hydrogen industry. The Ministry focused on implementing the legal frameworks and regulations necessary for its expansion, allocating viable production sites to attract investment, striving to localize this technology, and compiling the essential studies. Since hydrogen has a wide range of uses that contribute to diversifying energy sources, reducing carbon emissions, and fostering economic growth, the Ministry and Oman Hydrogen Company were able to launch opportunities and incentives for investment in the hydrogen sector, with more than 50,000 square kilometers allocated for green hydrogen projects to be offered in stages. Our ambitious plans aim to generate more than a million tons of green hydrogen by 2030 and almost 8 million tons of it by 2050 using 30% of the already permitted space.

Based on His Majesty Sultan Haitham bin Tariq's _may God protect him_ vision of achieving Carbon Net Zero in the year 2050 and establishing the Oman Sustainability Center based on the outputs of the Carbon Management Laboratory, we, the Sultanate of Oman, support the establishment of an efficient, balanced, and adaptable system to safeguard Omani natural resources and their sustainability in support of the national economy. This is a significant and encouraging step toward achieving carbon neutrality, which will help strike a balance between sustainable development and mitigating the impacts of climate change. It will also help develop a knowledge economy, diversify energy sources, and use clean technology to achieve sustainability.

The Oman Sustainability Center will work to ensure the implementation of the outputs of the Sultanate of Oman›s national carbon neutrality plan, as well as to monitor the various activities and their achievement of the targeted percentages of reducing greenhouse gas emissions. It will continue to develop opportunities in all targeted sectors in order to activate the implementation plan and to monitor changes on the international or local level that may occur during the implementation process.

The Ministry of Energy and Minerals is focusing on promoting local added value policies, localizing hydrogen-related industries, enabling strategic studies, research, and development, building national capacities, raising public awareness of clean energy, and any other related policies. This is done in order to achieve the strategic objectives by ensuring the Sultanate of Oman›s energy security through integrated planning for traditional and renewable energy resources, which guides the country›s transition to a more energy-efficient economy in a way that supports regional and global economic diversification. Additionally, it strengthens the Sultanate of Oman›s status as a significant, dependable, and competitive player in the world energy market.

Along with developing the renewable energy and green hydrogen sector in the Sultanate of Oman, it also aims to increase national potential by fostering national innovation, building up national competencies, and promoting renewable energy and clean hydrogen as a key tool for decarbonizing the energy, industry, and transportation sectors in the Sultanate of Oman and globally. By maximizing business opportunities and strategic alliances in the production and export of hydrogen, as well as accelerating the replacement of some local heavy industries in the energy sectors, where hydrogen could be one of the successful options, these initiatives will also hasten the replacement of these industries. As green hydrogen production technologies progress and become more competitive with other hydrogen alternatives, the Sultanate of Oman will become more competitive in boosting opportunities in the hydrogen sector through simple, transparent, and efficient procedures for investing in renewable energy and hydrogen projects. This will also encourage local companies to follow the green transition and migrate to green alternatives.

Hydrogen..
Energy of the Future

Green hydrogen is a ubiquitous, light, and highly reactive fuel that is created by the chemical process of electrolysis. This technique splits hydrogen from oxygen in water by deploying an electric current. We will develop energy without emitting carbon into the environment if this energy is generated from renewable sources.

Hydrogen colours

Green

Is made by using clean electricity from renewable energy sources like solar or wind power to electrolyse water into its core elements of hydrogen and oxygen. No carbon is produced as a result.

Turquoise

Produces hydrogen and solid carbon from methane. It counts as low carbon if it's powered by renewables and if the carbon's permanently stored or used for something else.

Blue

Is mainly produced from natural gas by using steam, producing hydrogen and carbon dioxide which then has to be captured and stored to make it truly low carbon.

Pink

Is produced through electrolysis powered by nuclear energy and has no emissions. It can also be referred to as purple hydrogen or red hydrogen.

Yellow

Is produced through electrolysis supplied by the electricity grid which have a mix of energy sources.

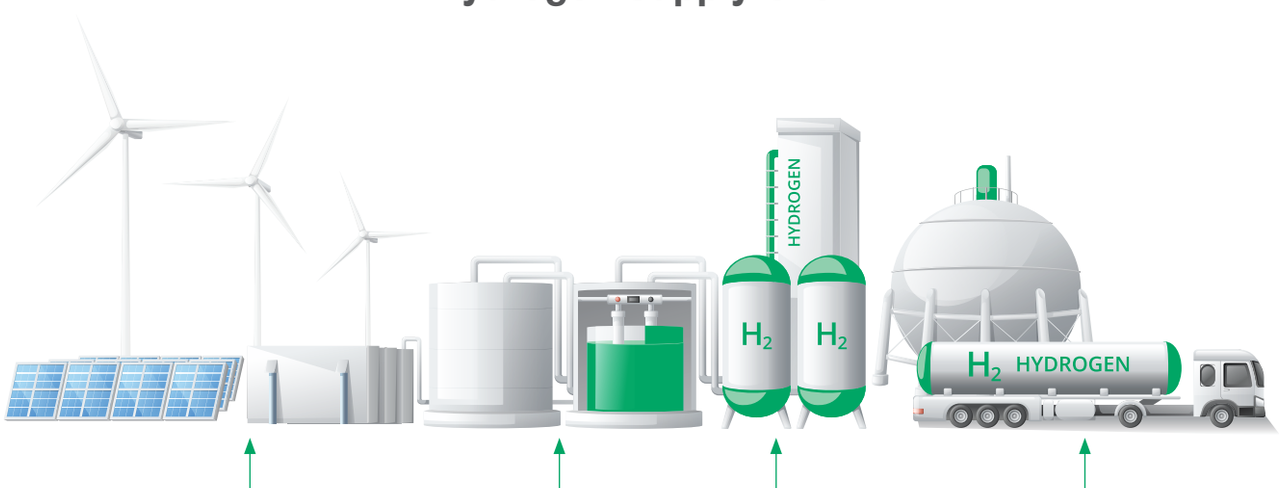
Grey

Is created in the same way as blue hydrogen but the carbon emissions aren't captured as part of the process.

Black & Brown

Uses coal or lignite to make hydrogen and is the most environmentally damaging way to make hydrogen.

Hydrogen Supply Chain



1. Electricity production from renewable energy (sun or wind)
2. Use of electric current to separate hydrogen from water
3. hydrogen storage
4. Transport and use of hydrogen

Sultanate of Oman.. The ideal location for green hydrogen projects

The Sultanate of Oman is the first Arab country where the sun rises.

Winds are a permanent source of energy throughout the year, unbound by sunset.

Our geographic location in the midst of east and west enables us to serve as a global hub for sustainable energy and a hydrogen refueling station for ships.

Larger than 50,000 sq km concession zones to manufacture hydrogen at the most affordable costs for global markets.

Minerals and key resources required for the manufacture of basic Renewable energy production equipment.

Port infrastructure in close proximity to hydrogen production sites.

Friendly and peaceful society. It was ranked among the best countries in terms of security and stability.

Modernity, prosperity, and a diverse and affluent modern lifestyle.

Facilitate investment in the hydrogen sector by providing capabilities, expediting procedures, and offering enticing incentive packages.

Clean energy to propel us forward

The Sultanate of Oman is working to achieve its goal in the green energy sector through partnership with various relevant sectors, in order to establish its position on the map of developing clean hydrogen production and use, so that it works and coordinates through alliances and joint work teams in a number of government agencies, oil and gas operators, educational and research institutions, in addition to ports, which will work together to support and facilitate the production, transport and use of clean hydrogen locally and export it as to push forward the development and use of clean hydrogen technologies in line with the energy diversification plans of Oman Vision 2040. As well as working to promote clean hydrogen by working on investments, technologies, policies and expertise throughout the entire hydrogen supply chain, and this will support Oman's national energy security and decarbonization efforts. This partnership will also contribute to the successful transition towards a green economy.

His Excellency Dr. Khamis Al Jabri
Head of the Vision 2040 Implementation Follow-up Unit

"The Oman Vision 2040 constitutes the guide and basic reference for planning and formulating national policies and strategies. Proceeding from the importance of creating effective, balanced and resilient ecosystems to protect the environment and the sustainability of its natural resources, which is the strategic direction of the priority of the environment and natural resources within the sustainable environment axis in Oman 2040 vision."

The unit organized a carbon management laboratory in cooperation and partnership with the relevant authorities, which culminated in the supreme directives adopting the year 2050 to achieve zero carbon neutrality and the establishment of the Oman Center for Sustainability.

The Carbon Management Laboratory, which focused on four main sectors: the energy sector, which includes electricity, oil and gas, the industry sector, the transportation sector, and the cities and buildings sector, came out with 49 approved projects and initiatives to achieve carbon neutrality goals, launch investment opportunities for renewable energy and green hydrogen projects, and launch the first package of concession areas for green hydrogen projects, and establishing the Hydrogen Oman LLC.

There is no doubt that the implementation of these directives requires intensive and harmonized efforts from all concerned parties, and to address the challenges that the various parties may face during the implementation stages.

The directives stipulating the establishment of the Oman Sustainability Center came with the aim of ensuring the implementation of the national plan for zero neutrality in line with the follow-up methodology to achieve the objectives of the Oman 2040 vision, following up on the implementation of all the plan's outputs of initiatives and projects, and addressing its challenges, in addition to informing decision makers of the requirements to achieve the specific goals in a timely manner.

The Oman Sustainability Center will be an intellectual and advisory reference to ensure the implementation of the national plan for zero neutrality by proposing strategies, policies and regulations, providing technical and advisory services, monitoring progress in reducing emissions, collecting, analyzing and disseminating information and data, developing available opportunities and activating operational plans, and following up on any international or local variables of zero neutrality programs.

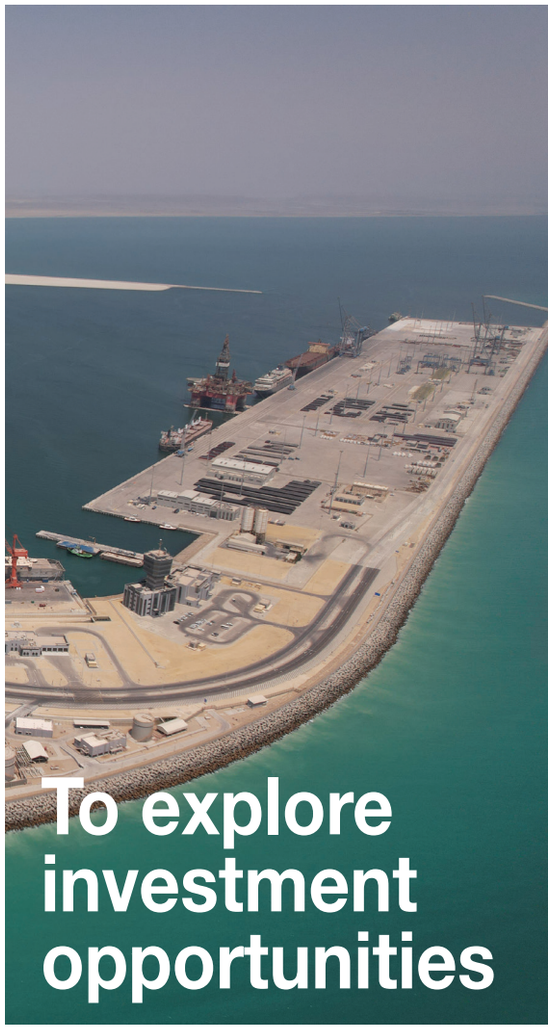
The center will also pay attention to technological progress, innovation and scientific research by coordinating local efforts, bringing in global expertise and applying best practices. It seeks to improve the business environment by supporting sustainable financing and circular economy programs, ensuring that the infrastructure is ready for investment, and contributing to setting standards and specifications.

In addition, the center aims to achieve a balance between environmental, social and economic systems by implementing various awareness and educational programs to rationalize consumption, build human resource capacities, and enhance local content.

This year 2022, The Public Authority for Special Economic Zones and Free Zones was able to ink-pact two usufruct agreements in Duqm for two projects after field studies were prepared and data was collected on solar and wind energy. These two companies, namely Hyport Duqm (a joint venture between DEME Concessions and OQ Alternative Energy) and Acme International, analyzed the data and the results were promising. As for Salalah Free Zone, it is expected that blue hydrogen will be produced in the early stages, and there are promising opportunities in the medium and long term for the production of green hydrogen also thanks to the availability of wind and solar energy in the sites designated for this in the Wilayat of Thumrait, according to the urban strategy. Prior to that, however, studies must be conducted to determine the cost of transferring energy from potential production sites in Thumrait to the Salalah Free Zone, Raysut Industrial Area, and Salalah Port for export. With regard to the Sohar Free Zone, there is a pilot project, which is an alliance between hydrogen producers and an iron factory with the aim of producing quantities of iron using alternative energy. As it is known, there is one project to produce solar energy in the Sohar Free Zone with a capacity of 25 megawatts that can be expanded, in addition to other requests, which will enable the region in the medium and long term to produce quantities of green hydrogen.

Thanks to the year-round availability of wind energy, the Special Economic Zone at Duqm stands apart from other free and economic zones. Therefore, two years ago, the Board of Directors allocated an area of 250 square kilometers for the installation of windmills in addition to solar panels, thus it is qualified to produce renewable energy throughout the day using solar and wind energy. In addition, the areas adjacent to Duqm are promising areas with vast lands and no natural obstacles that can accommodate the installation of quantities of solar panels and provide wind energy. These lands extend over an area estimated at more than 20,000 square kilometers. The Ministry of Energy and Minerals has made appreciable efforts to evaluate these sites and set the general framework for them in coordination with Hydrom (Hydrogen Oman LLC), in addition to other sites in the Sultanate of Oman. The Ministry announced it, and the investment of these areas is being promoted and opened for competition by the Ministry of Energy and Minerals and the coordination of the Authority in this regard. The port of Duqm and the paved, finished area adjacent to it, which can host a number of projects to transform renewable electric energy into green hydrogen and later into green ammonia for export, are what set Duqm apart, in addition to the presence of gas which also allows the production of blue hydrogen after finding a way to get rid of the associated carbon dioxide, and a backup electric line with a capacity of 400 kilovolts is underway connecting Duqm with electricity production stations in the north of the country, allowing the import and export of 1 gigawatt of energy through this line, which is expected to be completed in July 2023. Moreover, the Special Economic Zone Administration at Duqm is working to reconsider the service corridors and land uses adjacent to the port area and to explore ways to ensure the availability of sites for storing green and blue hydrogen and ammonia for the purpose of exporting or providing energy for new types of ships that switch to using alternative energy. Our discussions during the last visit with officials and specialists in the port of Antwerp and the port of Rotterdam and the surrounding economic areas in the Kingdom of Netherland were related to the requirements of transforming Duqm into a leading region in the manufacture and export of green hydrogen and green ammonia in particular, in addition to the infrastructure requirements and the opportunities that these projects create for the establishment of other complementary projects that will reflect positively on the national economy, whether through the use of alternative energy in Duqm to attract specific projects or the infrastructure required to facilitate the process of exporting these products outside the Sultanate.

There are other requests related to hydrogen production, whether in Duqm or in Salalah or in Sohar, and require the allocation of land areas for the production of renewable energy for wind energy for Duqm and Salalah or solar energy for Sohar. However, an agreement was reached among the Authority, the Ministry of Energy, the Oman Investment Authority, and the Ministry of Finance to postpone any new applications so that the Ministry of Energy and Hydrom (Hydrogen Oman LLC) can offer the various lands to potential investors to compete for them. After knowing the new winning projects, this authority will work to provide the necessary corridors within the plans of the free zones to cross electrical energy to the production sites of hydrogen and green ammonia, or to cross treated water pipes from the sites of desalination plants near the sea to the areas of alternative electricity production, or transiting hydrogen transport pipelines from energy production sites within free zones to ports, reservoirs and export facilities.



To explore investment opportunities

His Excellency Dr. Ali Al Sunaidy
Chairman of the Public Authority for Special Economic Zones and Free Zones (OPAZ)

"The Public Authority for Special Economic Zones and Free Zones is working in coordination with the Ministry of Energy and Minerals and the Hydrom (Hydrogen Oman LLC) to attract a number of green hydrogen projects through wind and solar energy production, and then the production of green hydrogen and converting it into green ammonia for export in the Special Economic Zone at Duqm."

Developing hydrogen economy

Oman has several green hydrogen and ammonia projects that have been officially announced. The OQ Group has 4 projects that are expected to generate more than 30 gigawatts of renewable energy in the Sultanate of Oman to produce green hydrogen. The value of these projects exceeds $40 billion, and we expect these projects to pass the final investment decision stage within the next decade, as each project we have is based on a joint venture model.

His Excellency. Abdulsalam Al Murshidi
President of Oman Investment Authority

OQ Group initiatives in green hydrogen and green ammonia

Hyport Duqm	A project to develop a green hydrogen and green ammonia production facility in the Duqm Special Economic Zone. The project will have a capacity of 1.3 GW of wind and solar energy.
Hydrogen Oman	a project to develop a facility for the production of green hydrogen and green ammonia in the Salalah Free Zone. The project will have a capacity of 1.3 GW of wind and solar energy.
Salalah Hydrogen	The project will see the development of a second facility for the production of green hydrogen and green ammonia in the Salalah Free Zone. The project will have a renewable capacity of wind and solar energy of 3.8 GW.
Oman Green Energ	Developing a green facility for the production of green hydrogen and ammonia in Al Wusta Governorate. The project will have a capacity of 25 GW in wind and solar energy and will be built in several phases.

The energy sector in the Sultanate of Oman is undergoing a remarkable transformation as the country moves forward in its quest to build a hydrogen-focused economy based on Oman 2040›s vision of diversifying its sources of income 2040. The Oman Investment Authority, along with its subsidiary OQ - represented by the alternative energy sector - plays a crucial role to enable efforts to achieve the national economic goals of the Sultanate of Oman and reach zero neutrality by 2050.

We look forward to enabling the energy transition in the Sultanate of Oman by strengthening the key role in the alternative energy sector, and continuing efforts to develop the green hydrogen value chain; with the aim of maximizing the in-country value added. The Authority pays great attention to attracting foreign direct investments in this sector in supply chains, localizing related industries, facilitating procedures in line with national priorities in expanding the base of industries, creating attractive and suitable opportunities for Omani youth, in addition to developing the research and development system. So far, we have been able to enter into partnerships with a group of external companies such as DEME, Uniper, ACWA Power, Air Products, InterContinental Energy, EnerTech Holdings, Marubeni, Linde and Dutco.

Globally, there is increasing momentum for the energy transition, particularly for green hydrogen exports. The Sultanate of Oman seeks to promote green hydrogen projects as part of efforts to be carbon neutral by 2050, as well as using these projects to enhance energy security and economic development, expand supply chains and associated industries, and create attractive local job opportunities.

The Sultanate of Oman enjoys a unique location, which distinguishes it by receiving high speeds of wind and solar energy throughout the year. As such, three ideally located areas for green hydrogen production were selected: Duqm, Dhofar and Al Jazer. Renewable energy lands cover 50,000 square kilometers and will be developed in phases.

There are five strategic objectives for the transition to green hydrogen, and to ensure the alignment of supply and demand in the Sultanate of Oman, which are:

- Diversify the local economy and onshore supply chain
- Connecting industries and creating long-term local jobs
- Decarbonization for a sustainable future
- Establishing a green hydrogen sector with a competitive hydrogen cost to attract foreign investors
- Support innovation and skills development

Green energy conserves and safeguards the environment.

The Environment Authority works to support green growth and all the processes of transforming linear economic paths into green paths in order to meet national and international requirements, as the Sultanate of Oman is one of the leading countries in preserving the environment and its natural resources and the balance and sustainability of ecosystems. Therefore, the authority fosters and facilitates the issuance of the necessary environmental licenses and permits, and tries to simplify the procedures in order to expedite the process. Additionally, it aims to support green projects through a variety of means, including economic empowerment. Green hydrogen projects are undoubtedly one of the Sultanate of Oman›s strategic pillars for achieving zero-carbon energy production, particularly in light of the availability of the three key components for such projects› success: space, solar energy, and wind energy, in addition to their strategic location and the availability of the necessary logistical basic construction.

The Sultanate of Oman's declaration for the year 2050 to achieve zero neutrality places it in the ranks of the environmentally leading countries, a rank that the Sultanate has maintained for decades, as the Sultanate of Oman is one of the first countries to establish official and civil institutions concerned with the environment, as well as to promulgate laws that guarantee the preservation of the environment and the sustainability of its resources, and even international prizes have been allocated to preserving the environment.

The Sultanate is still striving to support every initiative that aspire to protect and maintain the diverse ecosystems. This declaration also enhances the Sultanate's environmental position, which promotes economic performance by minimizing investment demands from export and other operations, as well as making it easier to secure investment funding and loans when required and at reasonable profit rates.

His Excellency Dr. Abdullah Al Amri
Chairman of Environment authority

"The increased local and worldwide reliance on green hydrogen energy boosts and supports international efforts to reduce greenhouse gas emissions, notably carbon emissions, and provides more chances for the realization of national and international plans for zero neutrality. It also makes it possible for the industrial, production, and other sectors to accomplish their emission reduction targets since they will rely on clean green hydrogen energy rather than conventional fossil fuels."

Energy Transformation Journey

The draft national energy strategy shall lead the Sultanate of Oman›s energy transition journey and the accompanying transformations in key sectors such as electricity, transportation, buildings, and industry sectors, in addition to the oil and gas sector. The Sultanate of Oman›s objective of achieving carbon neutrality by the year 2050 will also be realized thanks to this initiative.
In collaboration with its partners, the Ministry of Energy and Minerals investigated the hydrogen market and evaluated global demand applying demand forecasts issued by key international organizations.
Additionally, it carried out comparative studies for key target customers, which are primarily Western Europe, who aspires to import ten million tons of hydrogen by the year 2030 AD, and Asian countries notably Japan and South Korea. Accordingly, it was concluded that it is possible to set a target for producing one million tons of hydrogen by offering 6 investment opportunities on areas between 310 and 320 km2.
In order to attract investors and promote investment opportunities, whether through direct meetings or through conferences and seminars, the Ministry collaborates with the Ministry of Foreign Affairs, the Sultanate of Oman›s embassies abroad, the Omani Investment Authority, the Public Authority for Special Economic Zones and Free Zones, the Ministry of Commerce, Industry and Investment Promotion, OQ, and Hydrom.

Abdulaziz Alshidhani
DG, Renewable Energy and Hydrogen

Jan 2021
Hydrogen Economy feasibility study.

Aug 2021
Establishment of National Hydrogen Alliance (Hy-Fly).

Royal Directivesfor Hydrogen

- Set the required strategy, policies and legal framework.
- Allocate lands for green Hydrogen.
- Establish a Directorate General for Renewable Energy and Hydrogen.
- Establish a company to develop the Hydrogen sector.

Mar 2022

Apr 2022
- Directorate General for Renewable Energy and Hydrogen.
- Forming a team to unify renewable energy efforts.

Jun 2022
- Incorporation of HDO.
- Tender for Energy Transition Policy & Legal Framework projects.

Sep 2022
- BoD Approval of HDO's strategy & rebrand.
- Kick-off of Energy Transition Policy & Legal Framework projects .

Oct 2022
- Announcing the Oman's green hydrogen strategy.
- Official launch ofHydrogen Oman.

Nov 2022
- Announcing the launch of the Sultanate of Oman's national strategy for the gradual transition to zero neutrality.
- Announcing the launch of the National Environmental Energy Strategy.
- The launch of the pre-qualification phase for investors interested in engaging in the first round of investment opportunities in green hydrogen production projects.

Dec 2022
- Green hydrogen summit organization.
- Presenting investment proposal documents for two green hydrogen project opportunities in the wilayat of Duqm.

Oman plans massive capacity installation and investments

in the green H2 sector by 2050

~300M
Solar panels1

~10K
Wind turbines2

~5,200
Electrolyzers3

~180GW
Renewable capacity

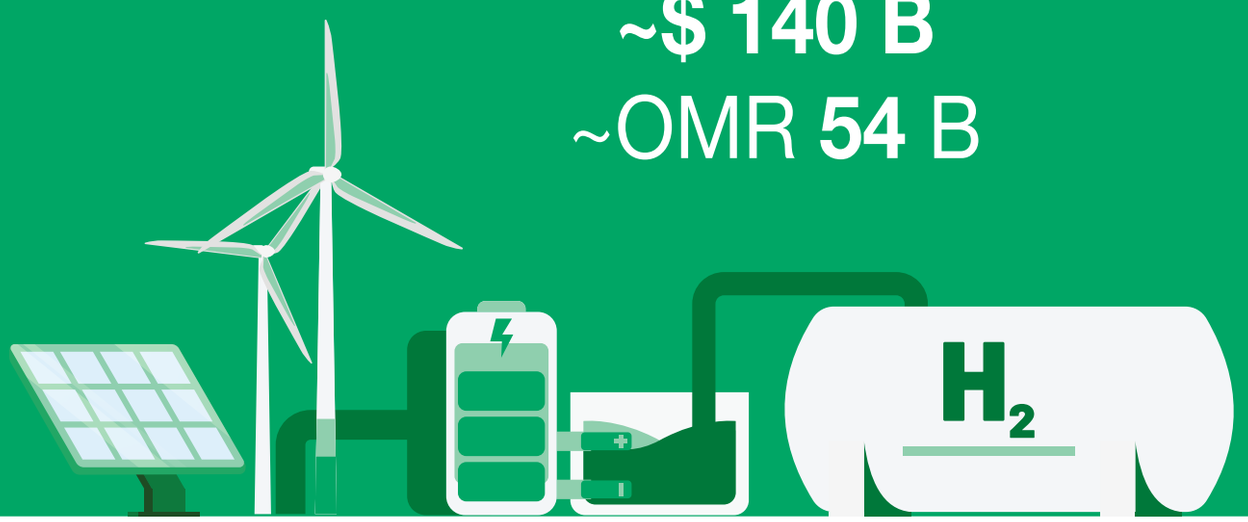
~100GW
Electrolyzer capacity

~70k (2030-2050)
New permanent jobs, of which ~17k are managerial

Cumulative investments by 2050 required in Oman Green H2 Economy

~$ 140 B

~OMR 54 B

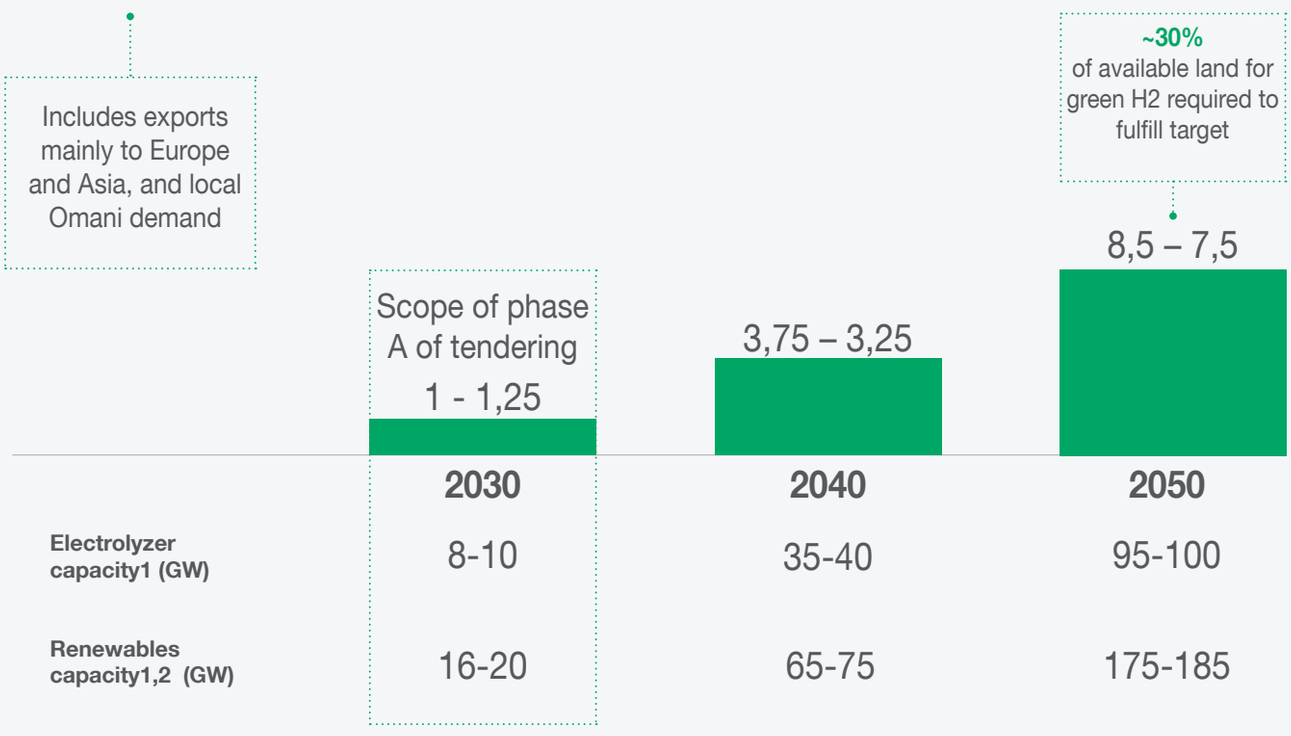


Investment opportunities in future energies

To lead the country's ambitious green hydrogen strategy, the Government has established Hydrogen Oman SPC (Hydrom), a fully owned independent subsidiary of Energy Development Oman SAOC. Regulated by the Ministry of Energy and Minerals (MEM), Hydrom is the overall master planner of Oman's green hydrogen sector. Its mandate includes the delineation of Government-owned land areas and the structuring of associated large-scale green hydrogen projects, managing the process for their allocation to developers as well as facilitating the development of common infrastructure and connected ecosystem industries and hubs.

Early November 2022, Hydrom launched the Phase A of its auctioning process aimed at awarding land blocks for large-scale, integrated green hydrogen projects by 2023, in order to meet the 2030 production target of one million tons of hydrogen per year. This Phase A is structured in two rounds, a first round offering two blocks in the Duqm area to be concluded by Q1 2023, and a second round following later in 2023 offering an additional two to four blocks.

Green H2 production ambition for Oman in 2030-50 (Mtpa)



For phase A, Oman plans two tender rounds, with 1st projects to be awarded by Q1 2023

1st bid round	Nov. 2022		Dec. 2022-Jan. 2023		Feb.-Mar. 2023	Mar. 2023	
	RFQ release	Application & Qualification (RFQ)	RFP release	Bid submission (RFP)	Project evaluation	Contract signing	Winners of 1st round

Qualification has no deadline. As soon as applicant is qualified it receives RFP (bid submission deadline remains unchanged)

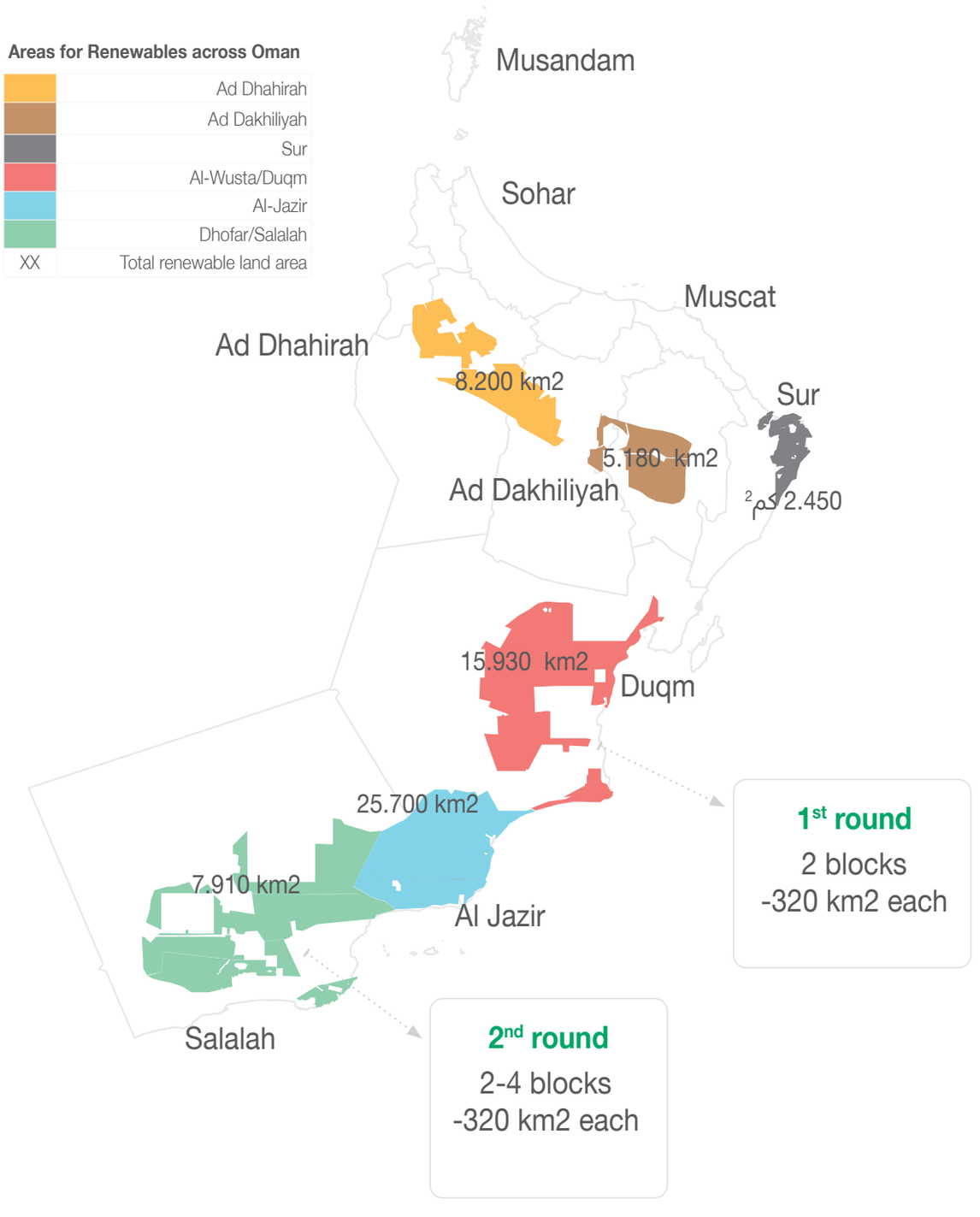
2nd bid round	Apr. 2023	May-Jul. 2023		Aug.-Oct. 2023		Nov.-Dec. 2023		
	Investor roadshow	RFQ release	Application & qualification (RFQ)	RFP release	Bid submission (RFP)	Project evaluation	Contract signing	Winners of 2nd round

The first stage of bids on green hydrogen projects

For phase A of tendering, 2 blocks in Duqm and 4 blocks in Salalah have been selected in order to meet 2030 production target.

6 blocks
~1900 km2

1 Mtpa of H2
2030 production target



Dr. Abdullah Al-Abri
Consultant and Sultanate of Oman's Representative at the International Energy Agency

The Sultanate of Oman is well positioned for green hydrogen production and export – thanks to the competitive renewable resources, existing energy and transport infrastructure, industrial ports as well as established international partnerships. The Sultanate's focus on export markets can play a critical role in the trade of green hydrogen and its derivatives, green products and emission-free transhipment activities; but will also work well to expedite the transition and integration of renewables for the local market in Oman.
Green hydrogen will play a central role towards the aspirations for net zero by 2050, and will be a fundamental enabler to make the conventional hydrocarbon business in the country more resilient.
We are working with Oman on projects related to the market opportunity for renewable hydrogen, supply chains, and macroeconomic models. We undoubtedly see Oman as leading the race for green hydrogen!

Jauad El Kharraz
The Executive Director of the Regional Center for Renewable Energy and Energy Efficiency (RCREEE)

The Sultanate of Oman is a prominent model in the region since it has the fundamental resources like wind and solar energy as well as the infrastructure of gas pipelines and ports notably the ports of Sohar and Duqm. Political determination prevails at the highest levels, underscoring the significance of the Sultanate's transition to carbon neutrality.
Germany and other European countries are particularly interested in the Omani market and the extent to which green hydrogen may be supplied to European markets, which is made possible. In order to achieve carbon neutrality by the year 2050 AD and to support the global climate agenda, the Sultanate of Oman has implemented policies and investment incentives, developed suitable regulations, built Omani capacities, and progressed toward a green economy.

Ali Al-Saffar
MENA Regional Director /The International Energy Agency IEA

The reason behind the importance of Oman for the International Energy Agency is because The Sultanate plays a leading role in decarbonisation efforts in its domestic industry as well as in the Middle East and North Africa region. At the same time, Oman keeps looking at ways to diversify its energy and economy. IEA considers Oman as an exemplary story.
IEA works together with the government of Oman, namely the Ministry of Energy, to seek ways where we can work together to decarbonize pilot gas, carbon fuels, including low carbon hydrogen, and to find ways in which to propel further industrialization and to make sure that economic diversification happens at the same time as the energy transition.
Success is a journey and it is not impossible, it can be achieved. We can use Oman as an example to follow in energy transition and economic diversification. A country that can lead the way to a much more successful and much more economically prosperous regions.
It's very important when we talk about energy transition, we make sure that nobody is left behind. This can create good quality jobs that can create economic resilience. We are working on projects in this regard and we hope to shed light on this very important topic. Oman is so important because it is, in some ways, an exemplar in the region. It is doing things before many other countries and we are very excited to be part of this great journey.

Green hydrogen economy

Nasser Al Rizeiqi
Director of Hydrogen Policies and Strategies Department

Hydrogen is widely used in different applications including ammonia production, petroleum refining and other energy- related areas. Today, hydrogen technologies are rapidly advancing in line with the world's shift towards cleaner energy on the road to Net Zero Emission targets, and perhaps more importantly, to meet global energy demand growth as well.

Among the frontrunners in the emerging hydrogen, space is the Sultanate of Oman where a number of strategic hydrogen projects are under early development as they seek to capitalize on the country's outstanding geographical location.

Developing a competitive and large-scale green hydrogen industry is critical to the Sultanate of Oman's goal to diversify the economy and achieve its 2040 Vision.

The importance of a large-scale hydrogen industry to the future of the Omani economy relies on the steps the country is taking to shape up the investment opportunities for this sector. There is a broad consensus that hydrogen can be the most effective solution in helping countries around the world achieve their decarbonisation goals in line with their commitments under the Paris Accords on Climate mitigation.

The shared perspectives on the different types of hydrogen – Grey, Blue and Green – and the respective technologies that can be deployed to produce them in Commercial quantities are still debatable because of their respective carbon footprints when compared with other production methods, with the global unanimous in their assertion that the green version of hydrogen has all of the hallmarks of an effective antidote to global warming, while also serving as a sustainable, low-carbon energy alternative to planet-warming resources.

Green hydrogen projects are driving the pace of large-scale green hydrogen adoption globally. The IEA predicts the uptake of renewables to hit a new peak by 2030 with hydrogen as a key enabler. It envisions the potential for hydrogen to be introduced into the energy sector by utilizing the existing infrastructure, which is already in place for natural gas. Originally slated to become a reality by around 2040, hydrogen as an alternative to natural gas is set to become Commonplace by 2030, which goes to show that technology alone, is driving the pace of Change in this space. Producing green hydrogen cost- competitively is still a significant constraint. Of course, there are cheaper methods to produce hydrogen, but these can have a severe environmental impact. Mitigating that impact will lead to phasing out grey hydrogen while low carbon hydrogen steps in as a transitional option in the hydrogen market that needs to address the amount of emissions with approved methods of carbon capture. However, the ultimate target is to have a green process to leverage the green economy, which can't be achieved without the adoption of green hydrogen.

Establishing this economy needs first to phase out the heavy emitters of harmful gases with cleaner energy resources while considering the economic impact of such initiatives, and then it can be followed by smaller scale projects that can raise the learning curve to support the local industry to establish green energy hubs.

A future green hydrogen economy will also need to look at hydrogen storage options in Oman. I quote here Michael Liebreich, founder of BloomberNEF, who said: "Oman is one of the places in the world that I've called the 'future renewable superpower' because what we really want is to produce green hydrogen with natural energy resources solar and wind. Oman is blessed with these two options making it one of biggest future dominants of this new market."

However, energy storage remains a challenge. Available options include salt domes, the use of green ammonia as an energy storage method, and utilizing chemical hydrates for different applications, among others. Speaking generally, the development curve of global energy storage markets – the United States, UK, Germany and Ireland -- are seen as leaders in storage technologies, which have enabled them to reach the stage of mass deployment.

The Middle East, however, is still at the conceptual and planning stage.

One of the enablers to solve this challenge is by allowing research centers to conduct various research fields in this sector to raise social awareness of the importance of green energy, thereby encouraging youngsters to explore career opportunities in the new hydrogen economy. Overall, green hydrogen's potential is massive in Sultanate of Oman, to spark that growth, the Ministry of Energy and Minerals has taken serious steps to introduce low-carbon economy for the country.

Energy between **wealth and sustainability**

Alhaitham Al Mushefri
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The ascending stages of the journey mankind took to fulfill its energy demands aided in the development and advancement of civilizations. Starting with coal and going on to oil and gas, fossil fuels were one of the most important discoveries that pushed man to race against the wheels of time. Numerous aspects of life were fundamentally affected by these fuels, particularly transportation and industry.

However, this fuel increased the amount of greenhouse gases that cause global warming and the hazards related to climate change by emitting more carbon into the atmosphere as a result of its combustion.

The need to transition and diversify energy sources has arisen since fossil fuels have an environmental impact due to increased carbon emissions and are not sustainable. The development of clean and sustainable fuel was vital to gradually reducing reliance on carbon-emitting energy sources, and it helped mitigate the repercussions of fossil fuels on the environment.

Because of its inherent potential for creating clean energy sources that make use of renewable energy sources like the sun, wind, and water, are carbon-free, and are sustainable, green hydrogen has emerged as a significant contributor to the diversification of energy sources and the preservation of the climate. It is the final result of a process that splits water into hydrogen and oxygen using electricity produced from renewable energy sources. The world considers it as one of the most crucial factors in eliminating carbon emissions in the environment and as one of the most vital sources for the energy transition because of the features that foster its development, making it the fuel of the future.

The sustainability of green hydrogen, its ability to be transported via gas pipeline networks or other gas infrastructure, and the fact that it doesn›t release any emissions during production, transportation, or consumption are its key features. Thanks to the multiple storage methods that are being studied for further development, it may be used whenever it is convenient and does not necessarily need to be utilized right away after production. Green hydrogen can be an important energy carrier and can be used in various uses such as transportation, manufacturing industries, and others.

Recently, the frameworks, regulations, technological, and financial aspects of the hydrogen industry have attracted attention on a global scale. Through the collaboration headed by the Ministry of Energy and Minerals with the many relevant authorities and organizations, Oman is aware of the importance of this transition and is eager to keep pace with it, contribute to it, and take advantage of the opportunities it affords. MEM collaborated with its partners to develop national guidelines and policies for the energy transition.

In order to support the transition to the fuel of the future, green hydrogen, MEM was also able to launch opportunities and incentives aimed at investing in green hydrogen, and adequate sites were allocated to start investing in this industry.

Since fossil fuels, such coal, oil, and gas, were discovered hundreds of years ago and sparked an incredible human revolution that cannot be replaced in a few years, the energy transition is a worldwide issue where perspectives often collide. However, with time, dependency on it can be diminished gradually. They may still be the primary source of energy in the globe in 50 or 60 years. According to OPEC›s predictions, oil will continue to dominate the global energy mix and witness a rise in demand by 2045. Additionally, gas will rank second due to rising demand, while coal will rank third despite having the greatest waning demand.

The world will witness the fastest growth in renewable energy in the global energy mix, with its proportion rising to 10.9% in 2045 AD with worldwide support and low long-term production costs, compared to 2.6% in 2021 AD.