



2022
March

Hydrogen Opportunities for Qatar



CEO Roundtable White Paper

The Al-Attiyah Foundation



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The race towards carbon neutrality by mid-century has certainly gathered momentum in the past few years. Net-zero carbon aspirations are now increasingly common for countries, sub-national regions, and companies, with about 70% of the global economy now covered by firm or indicative net-zero targets.

Despite the excitement, widescale change to the entire economy is required if the goals of the 2015 Paris Agreement are to be met and temperature rise kept “well below” 2°C above pre-industrial levels by the end of the century (2100). It has become apparent that many different routes to net-zero will be necessary. These routes will be dictated not just by technology or overall economics but also by local needs and local assets.

CEO ROUNDTABLE WHITE PAPER

H.E. Abdullah Bin Hamad Al-Attiyah founded the CEO Roundtable Series as a platform for knowledge exchange and to encourage critical dialogue between the Foundation’s members, in the quest towards a sustainable energy future.

The quarterly events, which have been hosted in Qatar for five years, are highly anticipated networking sessions, as well as an opportunity for our members’ CEOs to examine essential matters of energy and sustainable development.



Hydrogen is becoming widely recognised as having an important role to play in the ongoing global push and transition towards clean energy. There is growing consensus that producing hydrogen in an environmentally friendly way, and using it in more urban activities, can help nations achieve their net-zero ambitions.

The development of hydrogen is a significant feature in the pathway to net-zero emissions, in many scenarios developed by a variety of government and state-level research organisations, private enterprises, energy agencies, and international platforms. The IEA net-zero emissions by 2050 scenario, for example, highlights that the needed total transformation of the world's energy infrastructure would require the expansion of the production of low-carbon hydrogen from the current level of 450,000 tonnes to 40 million tonnes, by 2030, just 8 years from now. The International Renewable Energy Agency (IRENA) estimates that hydrogen will account for nearly 12 percent of global energy use by 2050. As such, the hydrogen revolution could provide a \$2.5 trillion investment opportunity through 2050 for utilities, equipment makers and others seeking to curb their emission intensity.

It is therefore unsurprising to see that the global interest in the role of

hydrogen as a clean fuel is growing. According to the Hydrogen Council, global demand for green hydrogen is expected to grow rapidly in the medium term to 530 Mt, displacing 10.4 billion barrels of oil equivalent by 2050 or 37% of 2020's global oil production.

Governments, policymakers, and investors are gearing up to extol the virtues of hydrogen – an abundant resource that gives off no emissions when it is burnt as fuel. The use of hydrogen as a transportation fuel is receiving particular attention.

It is in this context that the Al-Attiyah Foundation hosted it's a high level, by invitation only, CEO Roundtable titled, "Hydrogen Opportunities for Qatar".

The Foundation brought together a team of internationally renowned experts, who shared their insights and perspectives on the current state of play for hydrogen, latest and most promising developments, some glimpses into what the future may hold, and key issues and opportunities for the State of Qatar.

This White Paper is a summary of what the global experts and distinguished guests discussed at the CEO Roundtable. In this publication we learn of the growing importance of

hydrogen; opportunities that the use of hydrogen as a source of power could present to Qatar; challenges that need to be overcome to realise these opportunities; the strategies needed for producing hydrogen in an environmentally sustainable fashion from the abundance of methane in the North Field; and the necessary strategic approach to develop the customer base and market for hydrogen



KEY POINTS RAISED

- The three methods to manufacture hydrogen were discussed, together with the colours commonly associated with different shades of the gas. Brown or grey hydrogen is made from methane via steam reforming and produces carbon emissions. Blue hydrogen uses the same process but also deploys carbon capture and storage technology to prevent the carbon dioxide (CO₂) produced from entering the atmosphere. For green hydrogen, renewable energy-powered electrolyzers are used to split water (H₂O) - into its component elements.
- The widespread demand for clean hydrogen will likely emerge only in the mid-2030s. However, during the current decade there will be a race to develop technologies to produce and deliver green hydrogen at industrial scale.
- Hydrogen production is expected to grow exponentially over the coming decades. However, while the growth would be spurred by increase in investment, reducing costs to make the gas commercially competitive would remain a significant challenge for some time.

- There is a significant amount of potential for hydrogen. In the short term, the focus would be on blue hydrogen, but in the medium to longer term, green hydrogen will become more affordable. Without incentives, it is generally considered that producing hydrogen for power generation, would take more than a decade.
- A lot of attention is currently focused on the production/supply side of hydrogen, but it is important not to neglect the demand side. Banks would be wary to finance green hydrogen projects without the ability to secure the kind of offtake agreements that are needed to give investors the confidence that hydrogen production is going to have a buyer.
- Effective carbon-pricing regulations could hold the key to unlocking the hydrogen economy, particularly boosting hydrogen uses for steel manufacturing, aluminium production, or mixing with natural gas for industrial use.

GUEST SPEAKERS

Moderator:



Mr. Stephen Cole,
International Television
Host & Moderator

Speaker:



Dr. Kerry-Ann Adamson,
Global Strategic Advisor
on hydrogen, Worley

Speaker:



Dr. Jan Frederik Braun,
Energy Transition
Researcher

Speaker:



Mr. Frank Wouters,
Senior Vice President
Energy Transition,
Reliance Industries

Speaker:



Dr. Chris Gentle,
Senior Advisor,
Partnerships and New
Ventures, World Energy
Council

SPEAKERS' INSIGHTS

At the start of the roundtable, the moderator invited His Excellency Dr Ibrahim Ibrahim, Vice-Chairman of the Board of Trustees of the Al-Attiyah Foundation, Former Economic Advisor at Amiri Diwan, and Former Secretary General of Development Planning, to make some opening remarks.

On behalf of HE Abdullah bin Hamad Al-Attiyah, Chairman of the Board of Trustees, HE Dr Ibrahim Ibrahim, welcomed the participants and highlighted the importance of discussing alternative sources of energy with experts and leaders in the industry. HE noted that hydrogen has been catapulted into industry discourse in recent years for good reason.

It is light, storable, and energy-dense, and its use as a fuel produces no direct emissions of pollutants or greenhouse gases. HE Dr Ibrahim Ibrahim further stated that, it is exciting to hear about the numerous projects in Qatar and abroad where hydrogen is or will be used in day-to-day activities such as cooling and heating and in sectors such as steel,

long-haul trucking, shipping and aviation. “Hydrogen production is an exciting and new way to further monetise Qatar’s great asset – the North Field,” HE concluded.

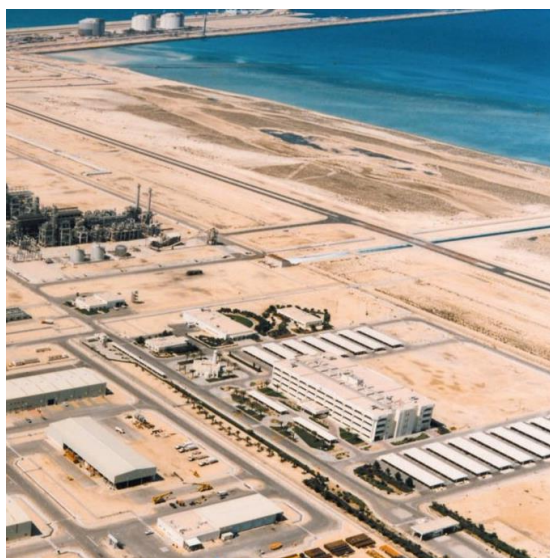
After HE Dr Ibrahim Ibrahim’s remarks, Dr Jan Frederik Braun gave a short presentation in which he highlighted how legislation was leading the way in the Energy Transition in the European Union (EU). While this could be hailed as a hopeful sign that energy transition is underway in Europe, there were also signs of divergence between EU countries in terms of implementation of laws and directives.

There was also a feeling that some of the targets set in legislation were not ambitious enough in respect to what must be achieved by 2050. Some definitions of important terms that were earlier missing have now been partially addressed by the publication of the EU taxonomy on definitions of sustainable projects.



On the invitation of the moderator, the other guest speakers made their introductory remarks that covered some of the following points:

- War and pandemics are not new, and the world can look to the example of World War 1 to see how to tackle such issues.
- The key issue at the moment is how to achieve a transition to a sustainable and low carbon emissions world economy.
- How to deal with energy price volatility, and how to take the rest of the world along with the rich countries who can afford to transition.
- Different countries will have to evolve different local strategies, that are in line with globally agreed requirements to tackle climate change.



OPPORTUNITIES FOR QATAR

The opportunities highlighted for Qatar included the following:

- Qatar has a clearly identifiable large source of hydrogen in the North Field.
- Qatar has a good track record of delivering complex world scale projects and the capability to implement further projects with current strategic partners.
- Qatar has transferable skills in running very low temperature distillation projects.
- Qatar has transferable skills in shipping low temperature cargoes.
- There are skills and entities already in place to encourage new trading opportunities in hydrogen or related commodities.
- Hydrogen “manufacturing and utilisation hubs” are already being planned in some countries. Qatar’s industrial cities would make an ideal alternative position for such hubs.
- The industrial processes to produce hydrogen and ammonia are well known both in Qatar and other countries where refining takes place.

However, the speakers also noted that the following challenges exist:

- Much more research is needed on the technical aspects of the liquefaction of hydrogen.
- Value chains for related hydrogen products have not been established.
- Hydrogen output even from mega projects is low. Hydrogen could supply 20% of the world's energy needs but a huge number of facilities would be needed to produce and ship such quantities. Resulting efforts may well lead to critical skills shortages.
- Prices for various forms of hydrogen (price colour differentials), have not been established, including the necessary specifications for projects.
- The technology for carbon capture and storage needed for blue hydrogen is still not fully developed.



The attendees were generally optimistic that opportunities exist for Qatar given the vast hydrocarbon resource, which the North Field provides, and the exciting possibilities that exist for producing hydrogen in an environmentally sustainable fashion.

It was noted that to convert “grey” hydrogen into “blue,” robust and scalable carbon capture and storage technology is needed. Many pilot plants are being developed but very few, large-scale plants currently exist.

If “blue” hydrogen is produced, then the opportunity exists to either store carbon dioxide in current geological structures or to use it for chemical purposes. A major problem is infrastructure to utilise hydrogen in major industrial countries.

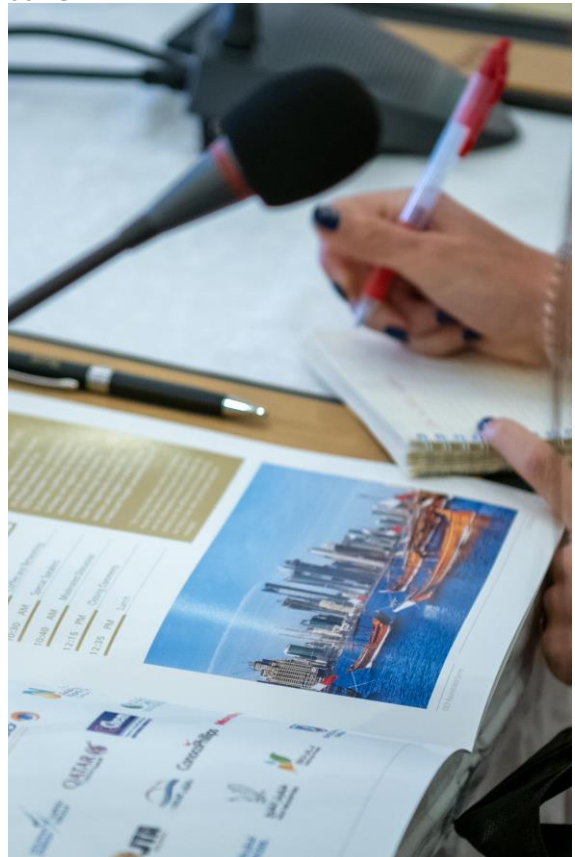
Creating demand for hydrogen is a major problem. However, there are some possibilities to start the process, such as fuel cells for heavy duty trucks or trains and the possibility of blending low levels of hydrogen into domestic gas supplies.

Price is an obvious problem for hydrogen. Electrolysers for green hydrogen are expensive and manufacturing has not been scaled up yet to the level that can reduce costs.

CONCLUSION

The moderator concluded that hydrogen as a fuel source is a topic that will continue to dominate global discourse around climate change in the coming years, as countries and institutions work towards the goals stipulated in the Paris Agreement.

In closing, H.E. Dr Ibrahim Ibrahim thanked the speakers and guests for their attendance and contributions to the discussion and said he is very much looking forward to the next CEO Roundtable that is scheduled for early June.





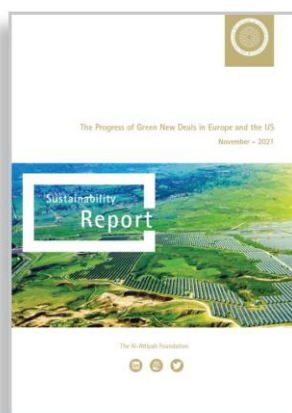
Have you missed a previous issue? All past issues of the Al-Attiah Foundation's Research Series, both Energy and Sustainability Development, and Whitepapers can be found on the Foundation's website at <http://www.abhafoundation.org/publications>



December - 2021

Consensus Forecasts on Long-Term Demand for Fossil Fuels

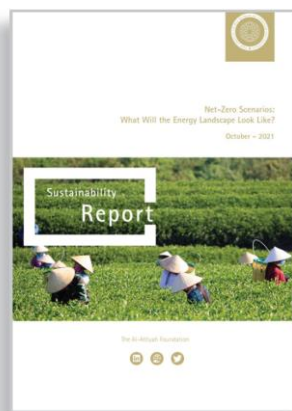
As the world begins to recover from the COVID-19 pandemic, a fundamental change is unfolding in the global energy system. Climate policy and advancing energy technologies are having an increasing impact alongside the short-term pandemic impacts and the usual long-term effects of economic growth and demographics.



November - 2021

The Progress of Green New Deals in Europe and the US

Governments in Europe and the USA want the recovery from the Covid-19 pandemic to be the springboard for environmentally and socially progressive policies. The EU has proposed the 'European Green Deal' and 'Fit for 55', while the administration of President Biden has put forward a 'Green New Deal' and the strategy of 'Build Back Better'.



October - 2021

Strategies for Sustainable Production and Consumption of Natural Resources

An increasing number of countries have committed to reach net-zero carbon emissions, usually between 2050-70. Any remaining emissions of carbon dioxide or other greenhouse gases would be cancelled out by increased forestry or other methods to remove atmospheric CO₂.



OUR PARTNERS

Our partners collaborate with The Al-Attiyah Foundation on various projects and research within the themes of energy and sustainable development.





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