

# AG Speaking Energy

Energy > AG Speaking Energy > The Emerging Hydrogen Economy: Update

30

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## The Emerging Hydrogen Economy: Update

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Oil and Gas, Renewable Energy

### Introduction

In December 2019, we published an overview of the emerging hydrogen economy. Since then, the world has changed dramatically with the rapidly evolving crisis created by the COVID-19 pandemic and commencement of the oil price war, both of which have wreaked havoc in global energy markets. In this article, we will consider the impact of recent events on the hydrogen economy and provide an update on some of the key developments and new projects in the sector.

### Where Are We Now?

Hydrogen is gaining increasing prominence as a key element in the future global energy mix. In a recent report published by a coalition of 19 major oil and gas, automotive, fuel cell and hydrogen companies (including Chevron, Shell, Engie, Hyundai, Microsoft, Toyota and Daimler AG), hydrogen is considered to have the potential to generate US\$140 billion per year of revenue in the United States alone by 2030 along with 700,000 jobs, rising to US\$750 billion per year and 3,400,000 jobs by 2050<sup>1</sup>. The report states that a number of key factors make the U.S. well positioned to establish itself as a leading player in the hydrogen economy including:

- Low-cost primary energy sources required for the production of low-carbon hydrogen and, in addition, an abundance of low-

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cost natural gas and carbon storage capacity for hydrogen produced via natural gas reforming with carbon capture and storage (**CCS**).

- The existence of well-established industry leaders in the U.S. capable of building the necessary scale to drive a hydrogen economy.
- Hydrogen is a strong low-carbon alternative in the U.S. transport sector<sup>2</sup>.

In Asia, Japan and South Korea remain at the forefront of the hydrogen revolution, with ambitious plans being put in place to help both countries make the transition to becoming hydrogen-powered societies. South Korea is proposing to build three hydrogen-powered cities by 2022, using the fuel for cooling, heating, electricity and transportation<sup>3</sup>. Consultation regarding location of the new cities was reportedly underway, but recent events (see below) are likely to see the projects delayed.

Meanwhile, Japan, where the Ministry of Economy, Trade and Industry is actively promoting the adoption of hydrogen in its Basic Hydrogen Strategy<sup>4</sup>, recently announced completion of the Fukushima Hydrogen Energy Research Field, comprising a solar-energy-powered 10MW class hydrogen production unit, the largest in the world<sup>5</sup>.

However, Singapore is also starting to gain prominence as a center for hydrogen technology development. Earlier this month, five Singaporean and two Japanese companies entered into a memorandum of understanding to study how hydrogen can be utilized as a low-carbon alternative in order to contribute towards a clean and sustainable energy future for Singapore. Under the terms of the agreement, PSA Corp. Ltd., Jurong Port Pte. Ltd., City Gas Pte. Ltd., Sembcorp Industries, Singapore LNG Corp. Pte. Ltd., Chiyoda Corp. and Mitsubishi Corp. will develop ways to utilize hydrogen as a green energy source, such as research and development of technologies related to the import, transportation and storage of hydrogen.<sup>6</sup>

In our previous article, we highlighted the world's first coal-to-hydrogen demonstration project being undertaken in Victoria, Australia, by major Japanese power utility Electric Power Development Co., Ltd (known as "J-Power"), in conjunction with Kawasaki Heavy Industries, Marubeni Corporation, Iwatani Corporation and Sumitomo Corporation, and Australian Energy

company AGL Ltd., with support from the Australian national and Victoria state governments. Australia is now pressing ahead with further projects that should serve to cement its place as a world leader in the hydrogen sector. Earlier this month, the Australian Renewable Energy Agency (**ARENA**) announced that \$70 million of funding would be made available for hydrogen projects in Australia. The “Renewable Hydrogen Deployment Funding Round” will target the deployment of new large-scale electrolyzers with a capacity of at least 5MW (but with a preference on at least 10MW or larger). Any project receiving support from the fund will be required to source electricity from renewable sources, either directly or through a power purchase agreement or the purchase of large-scale renewable energy certificates<sup>7</sup>. ARENA also announced that it would provide AUD 1.25 million (US\$ 815,232) in funding to support a feasibility study for a renewable hydrogen demonstration plant in Queensland. The study, which has been ongoing since July 2019 and is being undertaken by Stanwell Corporation Ltd (a power company owned by the Queensland government), is assessing the technical and economic feasibility of installing a minimum of 10MW hydrogen electrolysis at the coal-fired Stanwell Power Station in Central Queensland. Stanwell intends to purchase electricity and green certificates from Queensland’s renewable energy projects in order to offset all emissions created by the operation of the electrolyzer<sup>8</sup>.

Queensland is also the setting for two new major hydrogen projects forming part of its green hydrogen strategy. Situated in Gladstone, a traditional hub for the extraction of gas and coal, the project dubbed the “H2-Hub” is estimated to cost approximately US\$1.61 billion and, if completed, will include electrolyzer capacity up to 3,000MW, producing renewable hydrogen and 5,000 metric tons of ammonia per day. The Queensland government intends to promote the state as a hub for renewable energy, including hydrogen.<sup>9</sup> The projects in Queensland, among others, have placed Australia at the forefront of the emerging hydrogen economy.

## New Developments

Following the release of our previous article, a raft of new hydrogen-related developments have occurred around the globe, some of which we have taken the opportunity to highlight:

- **Australia** – Global mining companies BHP, Fortescue Metals and Anglo American and engineering consultancy firm Hatch

announced that they are collaborating on a new “Green Hydrogen Consortium” with the aim of accelerating the production of renewable hydrogen. The companies reported that the consortium’s objective was to attempt to remove obstacles to the adoption of green hydrogen technologies and encourage innovation in the sector. The consortium will develop a mechanism for suppliers and operators to contribute to a range of development activities, including research, supply chain development and technology pilots. The Green Hydrogen Consortium will be based in Western Australia, where the federal government has praised the companies for undertaking the new project<sup>10</sup>.

- **Australia** – The state of Tasmania has set a 2040 target of renewable energy forming 200 percent of the state’s energy share to fuel the production of cheap green hydrogen. Tasmania claims that its excellent wind and hydropower potential leaves it well positioned to produce cheap hydrogen and act as a “clean-power battery” for the rest of Australia. Detailed proposals for meeting the ambitious target are expected to be released next month and to include “multi-gigawatt scale” green hydrogen production, supported by AUD50 million of state funding and driven by a 2GW renewable power plant.<sup>11</sup>
- **China** – Chinese utility company Beijing Jingneng has announced plans to invest US\$3 billion in a combined solar and wind power plant to produce hydrogen as an energy store. The project, located in Inner Mongolia, is scheduled to begin construction this month and aims to produce between 400,000 and 500,000 metric tons of hydrogen per year<sup>12</sup>.
- **Netherlands** – Shell, Gasunie and Groningen Seaports have launched the NorthH2 Project, which aims to produce green hydrogen using renewable sources. If the project proceeds, it aims to produce green hydrogen through renewable electricity generated by a 3–4GW offshore windfarm in 2030, rising to 10GW by 2040. It is hoped that NorthH2 will be a significant contributor to the objectives of the Dutch Climate Accord<sup>13</sup>.
- **Oman** – In February, Belgian engineering company DEME Concessions NV has been selected, along with unnamed local partners, to conduct a feasibility study into the establishment solar and wind-powered hydrogen production plant in the Special Economic Zone in Duqm, Al Wusta Governorate, Oman. The final investment decision on the project, which is proposed to feature electrolyzer capacity estimated between 250 and

500MW, is expected to be taken next year<sup>14</sup>. This announcement came shortly after the launch of the Oman Hydrogen Centre by the German University of Technology in Oman, in coordination with Hydrogen Rise AG. The center is intended to become an international competence hub for hydrogen research, technology, education and industry application<sup>15</sup>.

- **United Kingdom** – The U.K. government has announced £28 million (US\$36.47 million) in funding for five demonstration projects focused on hydrogen production. The proposed projects include two that are described as “low carbon hydrogen production plants,” as well as one using offshore wind power to produce hydrogen through electrolysis<sup>16</sup>.
- **United States** – Mitsubishi Hitachi Power Systems recently announced that it had been awarded a contract to supply two natural-gas fired turbines that, by 2025, will run on a mixture of 30 percent hydrogen and 70 percent gas before increasing to 100 percent renewable hydrogen by 2045. The gas turbines will be installed at the coal-fired Intermountain Power Plant in Delta, Utah, that is intended to transition to gas, followed by renewable hydrogen with a capacity of 840MW.<sup>17</sup>.
- **U.S. Automotive industry** – Hyundai, the South Korean car manufacturer, has signed an agreement to collaborate with the U.S. Department of Energy to support research and development of hydrogen technology. Under the terms of the agreement, Hyundai will provide five of its Nexo fuel-cell electric vehicles to the U.S. Department of Energy, who will operate the vehicles under harsh conditions to test durability, fuel efficiency and functionality. Hyundai will also contribute to the establishment of a small-scale hydrogen fueling station in the state of Washington<sup>18</sup>.
- **Fueling stations** – Over the course of 2019, 83 new hydrogen gas stations began operation around the globe. Asia led the way with 38 new stations opening, followed by Europe with 36. The remaining nine stations were spread across North America and the Arabian Peninsula. By the end of 2019, a total of 432 hydrogen fueling sites were in operation around the globe (a 400 percent increase since 2015). Looking ahead, South Korea has plans to construct 40 new filling stations for buses and cars<sup>19</sup>.
- **Shipping industry** – A new study, published by the International Council on Clean Transportation, has shown that 99 percent of transpacific voyages made in 2015 could have

been powered by clean hydrogen fuel cells. The study found that more than half of those voyages required only either minor changes to fuel capacity (such as replacing cargo space with extra storage for hydrogen fuel) or through an additional port of call for refueling. Approximately 43 percent were found to have been able to take place without any changes whatsoever<sup>20</sup>.

## Impact of COVID-19

It is impossible to provide an update on the global hydrogen economy without considering the impact of the 2019 novel coronavirus disease (**COVID-19**). The effects of COVID-19 have been far reaching, infecting the population of practically every country across the globe, while at the same time disrupting almost all aspects of trade and commerce.

There is concern in some quarters that efforts to revitalize the global economy are likely to shift focus from climate issues (including the development of green technologies such as hydrogen) in the short term, as national governments scramble to provide support for industries which have suffered hugely as a result of COVID-19 (not least the airline sector). These concerns appear to be genuine, particularly in light of the recent call made by Czech Republic Prime Minister, Andrej Babis, for the European Union to abandon its Green Deal and instead focus on fighting the virus that is currently paralyzing the world. The Green Deal, announced in December 2019, seeks to invest €1 trillion (US\$1.1 trillion) with the aim of making the EU economy net-carbon by 2050. Investments are intended to focus on huge offshore wind development, accelerate electrification of heat and transport, as well as the development of large-scale carbon capture projects and hydrogen storage and related infrastructure<sup>21</sup>. Industry players will be paying careful attention to what, if any, measures the EU may take in terms of a stimulus package to boost the economies of member states, particularly any support for the development of green technologies.

However, some see economic stimulus packages as a significant opportunity to accelerate the global energy transition. Fatih Birol, executive director of the International Energy Agency (**IEA**) recently commented that investment in renewables should be “a central part” of strategies being devised by national governments, as this would “bring the twin benefits of stimulating economics and accelerating clean energy transitions”.<sup>22</sup> Birol went further to state

that the significant investments required to raise hydrogen and carbon capture up to industrial capability “could be helped by current interest rate levels, which were already low and are declining further, making the financing of big projects more affordable”.<sup>23</sup>

Akin Gump has created the COVID-19 Resource Center, a blog focused on legal issues and regulatory developments related to COVID-19. The COVID-19 Resource Center has been established to deliver timely insights and analysis on the latest legal, regulatory and technical developments tailored to industry-specific interests and issues. We are actively working across industries (including those focused on hydrogen) to help clients navigate the potential effects of the outbreak on their respective businesses.

## Impact of the Oil Price War

The recent collapse in oil prices caused, in part, by the ongoing global oversupply and exacerbated by the impact of COVID-19, has, potentially, far reaching consequences for the development of the hydrogen economy. With prices cratering and U.S. oil and gas development slowing, natural gas and, consequently, hydrogen is expected to be hit. Currently, 99 percent of hydrogen is derived from natural gas and one-third of global hydrogen is used to refine crude oil into other petrochemical products<sup>24</sup>.

However, some see the current oil price war as a prime opportunity for “green” hydrogen derived from water and renewable electricity (as opposed to natural gas) to become the fuel of choice for the future. Manuel Kuehn, senior vice president of business development for Siemens Middle East, has said that “green” hydrogen could be the “new oil” in the next 20 years<sup>25</sup>. Siemens, the Dubai Electricity and Water Authority (**DEWA**) and Expo 2020 Dubai are currently collaborating to build the Middle East’s first solar-driven hydrogen electrolysis facility at the Mohammed bin Rashid Al Maktoum Solar Park in Dubai, the largest single-site solar park in the world based on the independent power producer model. The facility will test and demonstrate an integrated megawatt-scale plant to produce hydrogen using solar photovoltaic system (**PV**), store the gas and then deploy it for re-electrification, mobility or other industrial uses. In a recent interview, Mr. Kuehn said:

"It will be a big benefit because it will make people aware of the technology and we will get experience of what it means to run it under Middle East conditions in terms of temperature. This will help us to build up larger scale productions in the Middle East."<sup>26</sup>

## The Way Forward

The emerging hydrogen economy appears to be developing at pace as the number of new projects, in a variety of jurisdictions around the globe, continues to grow. The Asia Pacific region, primarily through Japan, South Korea and Australia, is expected to continue to lead the way in terms of new developments, but Europe is fast becoming a key market for hydrogen technology. In addition, the natural, technology and scale benefits of the U.S. energy and transport sectors have the potential to make the U.S. a future world leader in the global hydrogen economy. However, headwinds from the fallout of the COVID-19 pandemic and the oil price war are expected to have a detrimental impact for the foreseeable future, and it is difficult to predict to what extent these will affect hydrogen going forward. Nevertheless, the collapse in oil prices potentially presents an opportunity for "green" hydrogen, derived from renewable sources, to take center stage in the emerging hydrogen economy.

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<sup>1</sup> <http://www.ushydrogenstudy.org/> "Road Map to a US Hydrogen Economy,"

<sup>2</sup> Ibid.

<sup>3</sup> World Economic Forum, "South Korea is building 3 hydrogen-powered cities for 2022," November 8, 2019.

<sup>4</sup> "The Basic Hydrogen Strategy," published by the Ministerial Council on Renewable Energy, Hydrogen and Related Issues, December 26, 2017.

<sup>5</sup> Green Car Congress, "Fukushima Hydrogen Energy Research Field (FH2R) completed in Japan; aiming for low-cost green hydrogen production; P2G," March 8, 2020.

<sup>6</sup> S&P Global Platts, "Asia may draw lessons from Singapore's swift move on hydrogen," April 20, 2020.



<sup>7</sup> Renew Economy, *"ARENA opens \$70 million funding round to fast track renewables for hydrogen,"* April 15, 2020.

<sup>8</sup> Renewables Now, *"ARENA to back hydrogen feasibility study in Queensland,"* March 11, 2020.

<sup>9</sup> Hydrogen Fuel News, *"Australian green hydrogen strategy will include "gigawatt" plans for Gladstone,"* March 5, 2020.

<sup>10</sup> Mining Technology, *"BHP, Fortescue and Anglo American work toward green hydrogen for mines,"* March 18, 2020.

<sup>11</sup> Recharge, *"Australian state sets 200% renewable energy target to power cheap green hydrogen,"* March 4, 2020.

<sup>12</sup> Global Construction Review, *"Chinese energy company to build 5GW hydrogen production plant in Inner Mongolia,"* March 19, 2020.

<sup>13</sup> Renewables.biz, *"Shell consortium eyes 10GW offshore wind-hydrogen giant,"* February 27, 2020.

<sup>14</sup> PV Magazine, *"Renewable-powered hydrogen for Oman,"* March 5, 2020.

<sup>15</sup> Oman Daily Observer, *"First green hydrogen centre opens in Oman,"* January 27, 2020.

<sup>16</sup> CNBC, *"UK government announces millions in funding for 'low carbon' hydrogen production,"* February 18, 2020.

<sup>17</sup> S&P Global Platts, *"Plan advances to convert Utah coal-fired power plant to run on 100% hydrogen with storage,"* March 10, 2020.

<sup>18</sup> Korea JoongAng Daily, *"Hyundai signs hydrogen deal with U.S. government,"* February 12, 2020.

<sup>19</sup> Hydrogen Fuel News, *"Last year, 83 new hydrogen gas stations opened worldwide,"* March 10, 2020.

<sup>20</sup> Recharge, *"Hydrogen 'can power virtually all container ships crossing the Pacific,"* March 4, 2020.

<sup>21</sup> Green Tech Media, "*EU Green Deal Should Be Canceled Because of Coronavirus, Czech PM Says*," March 17, 2020.

<sup>22</sup> Recharge, "*Coronavirus crisis an 'excellent opportunity' to speed global energy transition: Birol*," March 16, 2020.

<sup>23</sup> Ibid.

<sup>24</sup> Forbes, "*Could Sinking Oil Prices Open Door For 'Green' Hydrogen, Some Hope*," March 20, 2020.

<sup>25</sup> Arabian Business Industries, "*Green hydrogen to be 'the new oil' in the next 20 years, says Siemens Middle East*," January 20, 2020.

<sup>26</sup> Ibid.