



FOCUS ON HYDROGEN: ACCELERATING THE ENERGY TRANSITION IN LATIN AMERICA

Latin American countries have an opportunity to leverage their significant renewable energy resources by scaling up green hydrogen production. Green hydrogen could support existing local electricity and transportation demands, and it could be commercialized and exported. Given the range of potential benefits of green hydrogen and Latin America's history of innovative approaches to energy markets, Latin America could be a pioneer in the field. In this briefing, we highlight current market conditions, next steps to support industry development, and pilot projects from across the region.

Key issues

- Clean hydrogen is on the rise as a fossil fuel alternative and energy storage solution
- Production costs of green hydrogen are expected to fall
- Several initiatives and pilot projects are being undertaken across Latin America
- Some Latin American countries have the potential to become green hydrogen export leaders

CURRENT MARKET & GREEN HYDROGEN

Hydrogen is a critical resource in some industrial supply chains and has the potential to reshape renewable energy storage, transportation, and end-point usage across sectors.

The current demand for hydrogen in chemical, refining and other manufacturing processes has been met through several methods of production, each typically reliant on fossil fuels that lead to carbon emissions (grey hydrogen). New methods of production have reduced and captured emissions, including hydrogen produced with natural gas (blue hydrogen).

Green hydrogen is produced using renewable sources of energy that do not generate emissions. One method of green hydrogen production is using renewable energy from wind or solar sources to drive an electrolysis process that divides water (H_2O) into its component parts, hydrogen (H_2) and oxygen (O). Other methods for green hydrogen production are also being explored and may approach commercial viability in the future.

Given that hydrogen does not release carbon emissions at the point of use, if emissions can be eliminated from the production process, green hydrogen could become a vital technology in tackling climate and environmental challenges while accelerating the renewable energy transition.

EFFORTS AND OPPORTUNITIES IN LATIN AMERICA

As reported by the International Renewable Energy Agency, Latin America is one of the most dynamic regions in the world with respect to the generation of electricity from renewable sources. More than a quarter of its energy is from renewable sources. Brazil, Chile, and Mexico are among the ten leading renewables markets in the world. Building on this dynamism, Latin American countries could take advantage of significant opportunities to use green hydrogen to address local energy market concerns and build out international market opportunities.

Market opportunities

Green hydrogen can be distributed directly to end-point users, stored locally for future use, and transported regionally or as a global commodity. As an energy source, green hydrogen can be used to operate fuel cells for power generation, distributed through repurposed pipeline facilities, and reconfigured into biofuels for transportation. In Latin America, green hydrogen could be used within existing renewable energy systems to store excess energy during peak generation periods and supply energy during low production periods.

Green hydrogen production has the potential to scale up to meet new demands within a wide range of sectors, while also reducing the carbon footprint of existing operations. Hydrogen is already used in heavy industry in the production of metals, in the chemical formation of fertilizers, and in other refining processes. Latin America's commercial maritime, heavy ground shipping, air travel, and public transit sectors could all be adapted to this new green energy source.

Economic feasibility

As with the development of the solar photovoltaic (PV) market, although generation of green hydrogen is expensive now, investment in green hydrogen-related technologies and strategic infrastructure may reduce the costs of production in subsequent years. PV began as an emerging technology with significant limitations just ten years ago and is now considered essential. As an example of the evolution of PV production costs, record-low prices were seen in the recent PV auctions in Mexico, Chile, and Peru. In respect of green hydrogen-related costs, the International Energy Agency forecasts that the cost of producing hydrogen from renewable electricity could fall 30% by 2030.

Similar to other emerging technologies, policy efforts (including tax policies and financial incentives), the regulatory environment, and public perspective of the industry will also be critical to its progress. International and national efforts to reduce carbon emissions should support the development of green hydrogen. Policy initiatives and pilot projects around the world demonstrate concrete steps that can be taken to develop the technology and support the new industry in existing energy markets. This positive momentum must also be matched by public attention to the environmental and social considerations for a particular location and application of green hydrogen technology.

Policy initiatives and pilot projects

Public programs and pilot projects have emerged across Latin America to generate interest and assess opportunities for green hydrogen in the region. However, as witnessed in other regions and industries, regulation could limit the development of the green hydrogen industry. Hydrogen is subject to regulation across Latin America as a dangerous substance, with rules typically applying to the use of hydrogen in transportation, storage, and industrial processes. Such existing regulations are unlikely to be appropriate for hydrogen use in energy applications and for the wider development of a hydrogen economy.

Argentina

Unlike other Latin American jurisdictions, Argentina already has legislation to promote the research, development, production, and use of hydrogen as fuel (Law 26.123, passed in 2006). However, despite the initial efforts undertaken by Argentina, secondary regulations have not been issued.

It remains to be seen whether the Fernandez administration will promote similar initiatives to those happening elsewhere in Latin America, such as the Verne Project in Uruguay and the Cavendish Mission in Chile (see further below), to make use of the 2006 legislation and the memorandum of understanding signed with Japan in 2019 by the Macri administration.

Chile

In Chile, a National Hydrogen Strategy is set to be released this year and the private and public sectors have already launched initiatives to raise awareness and discuss production, export, and green mining ideas, including the Cavendish Mission (*Misión Cavendish*).

Hydrogen is key in the energy transition for Chile, as it could represent up to 20% of the solution that Chile wants to promote to become carbon neutral by 2050.

Misión Cavendish was developed based on four goals or principles:

- Develop regulations for the use and production of green hydrogen.
- Compare international policies and best practices, mainly from Austria, Australia, California, Germany, Japan, and the United Kingdom, as leaders in green hydrogen.
- Reach an agreement between the private and public sectors in respect of a hydrogen action plan towards 2025.
- Identify and boost green hydrogen priority projects in Chile, such as hydrogen-diesel dual combustion systems for mining extraction trucks, green hydrogen production for ammonia, generation of green hydrogen by electrolysis, and green hydrogen injection in natural gas networks.

Costa Rica

Costa Rica – the Central American clean energy champion – has started to study the benefits of green hydrogen production. Through ICE (*Instituto Costarricense de Electricidad*), it has entered into agreements with:

- Siemens to manufacture electrolyzers for industrial use.
- Ad Astra Rocket to reduce carbon emissions in transportation.

French Guiana

In French Guiana, HDF Energy is developing a 55MW PV plant and 120MWh storage station based on hydrogen. This novel project will generate electricity through the combination of a utility-scale PV plant, long-term energy storage in the form of hydrogen, and short-term battery storage. HDF Energy is developing the *Centrale électrique de l'Ouest Guyanais* on the principle that hydrogen mitigates intermittency in solar power generation and enables the storage of large amounts of energy over long periods, compared to lithium batteries.

Mexico

Unlike the efforts made by Mexico to study carbon capture and storage technologies, the debate regarding the benefits of green hydrogen has not yet started in Mexico. The Electricity Industry Law considers as clean energy the generation of electricity through green hydrogen and fuel cells, and therefore, based on the Sector Program issued by the Ministry of Energy in July 2020, it is expected that debate and discussion about the production and use of green hydrogen will begin soon, as in Chile and Uruguay.

Despite the recent changes seen in Mexico's energy policy, green hydrogen could potentially be a solution for Mexico's commitment to generate 35% of its electricity from clean sources by 2024.

Uruguay

Although Uruguay does not have hydrogen-related legislation, the government, ANCAP (*Administración Nacional de Combustibles, Alcoholes y Portland*) and UTE (*Administración Nacional de Usinas y Trasmisiones Eléctricas*) are developing a green hydrogen transport project, called the Verne Project. The pilot project focuses on the decarbonization of cargo trucks through the use of electric trucks with batteries and fuel cells.

The Verne Project was designed on the foundation that 98% of Uruguay's energy mix comes from renewable sources with approximately 20% of residual load, while 70% of the hydrocarbons produced and imported by Uruguay are used for the transport industry, which is responsible for more than 60% of Uruguay's CO₂ emissions.

Similar to *Misión Cavendish* in Chile, the main objectives of the Verne Project are to:

- Develop an initial ecosystem for the production and use of green hydrogen.
- Identify barriers and policies to be designed.
- Develop a national roadmap and promote the use of green hydrogen in other applications (e.g., production of methanol, injection of hydrogen into the gas network, or export of green hydrogen).

FINANCING AND BANKABILITY

As seen in the financing of renewables projects across the region, multilaterals, such as the World Bank, the Inter-American Development Bank or the *Corporación Andina de Fomento*, and local development banks will play a fundamental role in the creation of green hydrogen markets and economies in the region. Their participation through the design of policies with

governments and the private sector, non-reimbursable technical assistance, institutional funding through Climate Investment Funds, seed funding, assistance through innovation laboratories like IDB Lab, and mainly, through the financing of projects, will be vital for the creation of hydrogen economies.

In the short term in Latin America, the following areas are seen as presenting the best opportunities:

- The development of co-located wind/PV and electrolyzer plants (as seen in Australia and French Guiana).
- Compression, liquefaction, and storage facilities (including port storage facilities for export purposes).
- Transportation-related pilot projects (e.g., trains, buses, and hydrogen fueling stations).

In the medium or long term, as seen in Germany with the project to build an 80-mile hydrogen pipeline in northwest Germany or with the 100MW electrolysis plant to be built in the Port of Hamburg, perhaps certain Latin American countries will develop this kind of infrastructure to expand their export capacities. Taking into account that certain regulations limit the volume of hydrogen that can be injected into gas pipelines, it is to be seen whether natural gas infrastructure could be easily converted to transport hydrogen.

The expansion of the green hydrogen industry and the associated risks will require committed parties and a conducive environment. BOT agreements with governments, offtake agreements between green hydrogen producers and distributors or end-users, as well as other usage, storage, conversion, or transportation arrangements, will all be critical to the feasibility and bankability of any project. Financing options may also be limited by the creditworthiness of the parties involved and the stability of the energy market. Technology risk will be an important factor to assess, and completion guarantees and fully wrapped EPCs might be expected.

WHAT IS NEXT?

Green hydrogen has the potential to fill a critical gap in global efforts to reduce carbon emissions, especially in Latin America, where significant progress has already been made in the renewable energy sector. As a future source of energy for heavy industry, transportation, and electricity generation, among other uses, green hydrogen responds to a series of unaddressed opportunities within existing renewable energy markets. Current pilot projects are demonstrating the viability of the technology, but the scaling-up of the industry will require established regulatory environments and partners committed to the production of green hydrogen and the distribution of the energy.

In terms of renewable power generation, the production and use of green hydrogen could result in a solution to the intermittency challenges seen across the region and may be an attractive alternative to diesel-based generation. For instance, Mexico recently passed several regulations – which were challenged by the private sector – that were intended to regulate the intermittency and dispatch order of renewable energies. It is to be seen whether the production of green hydrogen through electrolysis could address the regulators' and operators' intermittency concerns in Latin America.

In addition, due to Latin America's excellent conditions for the production of green hydrogen and the fact that hydrogen may become an internationally traded commodity, countries with great renewable resources, such as Chile, Uruguay, and Argentina, may become Latin American hydrogen clusters and hubs. At a global level, it is expected that there will be importing countries or states like Germany, Japan, South Korea, California, and Singapore, and exporting countries like Morocco, Saudi Arabia, Turkey, Ukraine, Egypt, Australia, Chile, Argentina, and other Latin American jurisdictions. As in other industries, importers and exporters will have different challenges and drivers. For example, Japan recently started, through a pilot project, the generation of electricity from hydrogen imported from Brunei, and therefore, it is expected that in the near future green hydrogen produced by Chile, Argentina, or Uruguay may be exported to Japan through Chilean ports.

Given that various countries in Latin America are analyzing the viability of green hydrogen in parallel, it is expected that certain Latin American countries may form alliances for the development of technical and scientific human capital, the exchange of best regulatory practices, the joint acquisition of equipment, and other regional initiatives.

Latin American countries have been at the forefront of renewable energy movements and have used dynamic mechanisms like clean energy auctions to drive the expansion of new industries. Green hydrogen has revolutionary potential, and current global development efforts will generate market-leading innovations.

Are Latin American companies, countries, and multilaterals ready to stay ahead of the pack in renewable energy leadership?

ABOUT

Focus on Hydrogen is a Clifford Chance briefing series covering hydrogen-related developments globally. 1.008 is the standard atomic mass of hydrogen.

For other hydrogen publications, please see our Climate, sustainability, green finance, and renewables page [here](#).

For hydrogen queries in other jurisdictions, please contact Anthony Giustini and Andreas Formosa (listed under Global contacts below).

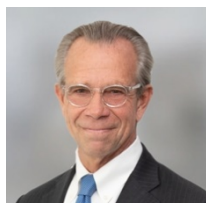
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