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Low-Carbon Hydrogen in Latin America: Current Context and Opportunities

Latin America is well positioned for a strategic role as a hub for the production and utilization of low-carbon hydrogen in the global energy transition.

Low-carbon hydrogen is set to play a key role in the decarbonization of the energy complex worldwide, and particularly in Latin America. The momentum of low-carbon hydrogen, although not new, has now accelerated following the November 2021 Conference of the Parties to the United Nations Framework Convention on Climate Change (COP26), where several governments restated their interest in and commitment to reducing carbon emissions by 50% by 2030.¹

Over the past year, several countries in Latin America have taken significant steps to integrate low-carbon hydrogen solutions as a key tenet of their strategic economic development and climate change plans. With world-class renewable energy resources, growing energy demand, and favorable legal frameworks, these jurisdictions are likely to play a major role in the global race toward low-carbon hydrogen. Hydro, solar, and wind power facilities drove Latin America's first phase of the energy transition. Now, low-carbon hydrogen is poised to become a principal driver of the next phase — but first it must overcome or solve for distinct regional challenges. In addition, the success of low-carbon hydrogen will depend on key policy decisions that will be made over the next one to two years by Latin America's central governments. One such policy issue will be balancing competing interests with (and setting clear rules for) existing stakeholders of current energy markets and regulatory frameworks and protecting foreign and local investments.

This *Client Alert* highlights recent developments in these regulatory frameworks, including their legal and policy significance, and identifies potential opportunities for international investor engagement. With contributions from local firms in the key markets of Argentina, Brazil, Chile, Colombia, Mexico, and Peru, we analyze both the region's potential to play a major role in the future low-carbon hydrogen landscape and the role that low-carbon hydrogen could play in Latin America's own clean energy transition.

Understanding Hydrogen Basics

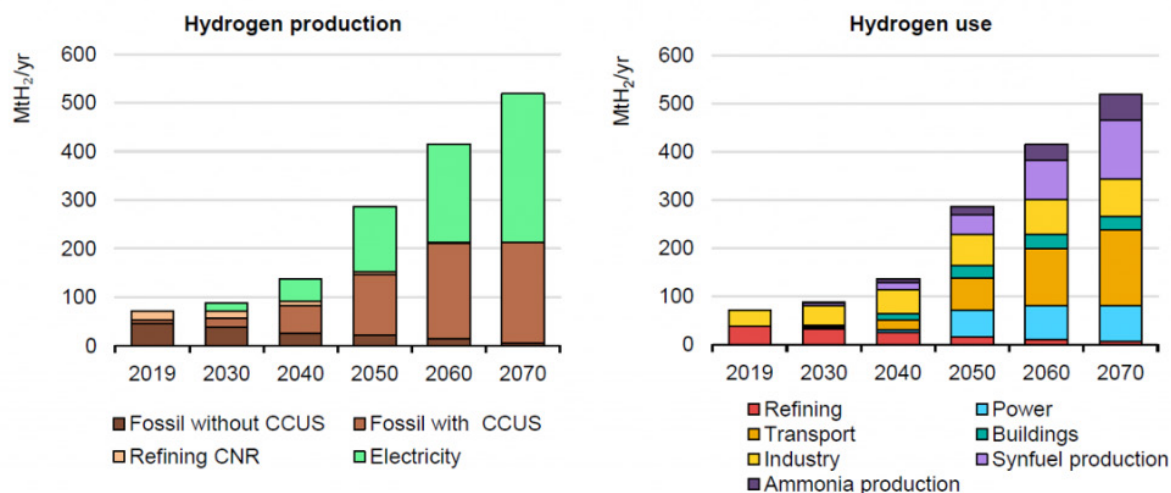
Hydrogen (H₂) is a highly combustible gas that may be used to store and transport energy. When used as fuel in a fuel cell to produce electricity, hydrogen produces only water as a byproduct,² meaning that it is zero-emission at its end use. Hydrogen can be produced through different processes, but currently commercial-scale hydrogen is produced principally by using heat or chemical reactions to release

hydrogen from fossil fuels such as natural gas (steam reforming) or coal (gasification) or by using an electric current to release hydrogen from water (electrolysis).

These production processes, and the storage and transportation of hydrogen, vary in efficiency and environmental impact. “Gray” hydrogen produced from fossil fuels, the most widely used method today, results in significant greenhouse gas (GHG) emissions.³ “Blue” hydrogen refers to the production of hydrogen from fossil fuels (e.g., natural gas) combined with carbon capture, utilization, and storage (CCUS), which can significantly reduce hydrogen’s production emissions. “Green” hydrogen refers to hydrogen produced by water electrolysis using renewable energy sources such as wind or solar power, and derivative products such as green ammonia (NH₃) and green synthetic fuels (synfuels).

For purposes of this *Client Alert*, the authors will mostly ignore the distinction between gray, blue, green, and other types of low-carbon hydrogen. More importantly, the transition from gray to blue to green illustrates the degrees of environmental performance, in terms of energy consumed and GHGs emitted, that can be achieved through various production processes. These characteristics of low-carbon hydrogen can also be measured and described in terms of the Carbon Intensity Score (CI Score) used to establish the amount of tradeable credits a fuel can generate. Since hydrogen has a higher specific energy (two to three times the energy per unit of mass) than traditional fossil fuels like gasoline or natural gas, hydrogen is a prime candidate for industries with significant energy needs, such as aviation, cargo shipping, heavy-duty transportation, and steel production, regardless of carbon intensity.

The below graphics illustrate the International Energy Agency’s worldwide hydrogen production and use forecasts for the next 50 years, setting the global context in which to situate Latin America’s potential and competitiveness in hydrogen markets.



Source: International Energy Agency’s [Global Hydrogen Review 2021](#)

Latin America Potential and Competitiveness

Transportation costs, diversity of use, and lack of captive demand are significant market obstacles to large-scale adoption of green hydrogen in Latin America. As with other large infrastructure projects, sovereign and exchange risk and other economic variables pose challenges as well. However, Latin America shows strong potential for green hydrogen production and use due to the availability of renewable energy, growing local demand, and the ability to transport green hydrogen and its byproducts to meet growing international demand.

The renewable energy industry is mature and benefits from well-established regulatory regimes, with sponsors and lenders heavily involved in setting up and seeking international financing for renewable projects. Due to state-led investment in hydropower and major ramp-ups in onshore wind and photovoltaic solar power development, renewables make up 55% of Latin America's power generation, above the global average of 35%.⁴

In 2019, Latin America's industrial and oil refining sectors already required more than 4 Mt of hydrogen (around 5% of global demand), mainly to produce ammonia, methanol, steel, and refined oil products. This hydrogen production required more natural gas than Chile's total gas supply, and released more CO₂ into the atmosphere than all of Colombia's road vehicles. In addition, almost 90% of Latin America's hydrogen demand in 2019 was concentrated in its five largest economies and in Trinidad and Tobago.⁵

Moreover, Latin America's legacy of export-led growth means that export channels are already established to satisfy increasing hydrogen demand worldwide. Notwithstanding today's nascent green hydrogen production market, the International Energy Agency estimates that the number of electrolyzer projects and installed capacity increased from less than 1 MW in 2010 to more than 70 MW in 2020, while renewable energy prices and the cost of electrolyzers fell over that period.⁶ Currently, hydrogen production and use in Latin America is limited to a few countries that use it mainly as a feedstock for refineries and the chemical industry. Large-scale green hydrogen production is most likely to develop in coastal areas that are rich in renewable resources, which coincides well with the distribution of commodities at ports suited for global export.

In addition, other Latin American economies not featured in this *Client Alert* may be able to harness the advantages of Latin America becoming a low-carbon hydrogen and ammonia exporting region, as efficiency and technology gains will likely help them in their efforts to decarbonize mining, heavy-duty and commercial transport, chemical production and refining, and steel production.

Comparative H₂ Regulation

A fully formed and functioning hydrogen economy is still not a reality in Latin America, which faces unique challenges in its infrastructure markets and regulatory frameworks.

Stakeholders in the gas industry advocate for a staged approach to developing the hydrogen economy, beginning with developing CCUS technologies to enable blue hydrogen production. Natural resource extraction companies believe there are significant synergies with hydrogen to be explored before a full transition to green hydrogen, and given their established reserves of natural gas, coal, and other fossil fuels, they largely prefer to focus on CCUS opportunities to repurpose existing facilities to accommodate blue hydrogen.

Due to the significant costs involved in sufficiently scaling up infrastructure for hydrogen production, storage and transportation, governments have an important role to play in supporting industry investment and creating a regulatory framework that can support hydrogen project development, particularly in a

region that does not already benefit from the natural gas infrastructure available for conversion as in North America and Europe.

Statutory corporate law in Latin America's civil law jurisdictions can be relatively stifling to corporate innovation compared to international investors' home country frameworks, and most countries in Latin America lack specific regulations regarding hydrogen. However, Argentina, Brazil, Chile, and Colombia have already either included hydrogen roadmaps in their national energy strategies or passed early-stage regulations aimed at fostering hydrogen (Mexico and Peru do not currently have a legal framework in place).

Argentina

Argentina passed an early law in August 2006 aimed at promoting hydrogen energy as a matter of national interest and has operated a pilot project, Hychico, since that year. Nevertheless, the law is set to expire at the end of 2021, and while its government is working on a new regulatory framework that it hopes will incentivize development of a green hydrogen industry, the executive branch has not yet determined which agencies should be responsible for its long-awaited national hydrogen program.

Still, Argentina's recent tenders for renewables, along with the creation of a corporate market for power purchase agreements, can contribute to supplying the necessary energy for potential new hydrogen projects. In addition, Argentina's world-class resources, such as wind in the plains of eastern Patagonia and solar in the northwestern and western regions, allow Argentina a potentially important role as a global export hub for green hydrogen. Notably, at COP26, an Australian mining group announced a plan to invest as much as US\$8.4 billion in a green hydrogen project in Patagonia.⁷

Brazil

Brazil benefits from established fossil fuels, diversified renewables markets, access to a massive coastline, and a robust energy transport infrastructure. In addition, the size of the local consumer market and favorable port and logistics infrastructure are key factors for the growth of the Brazilian hydrogen market. Alongside a recent government commitment to hydrogen research and development, private initiatives for green hydrogen mega-projects that capitalize on tax-free zones and nascent offshore wind projects have been announced at several major ports on the renewables-heavy northeastern coast.

Following the publication in late 2020 of Brazil's National Energy Plan 2050, which identifies hydrogen as a fundamental disruptive technology for the energy transition, in October 2021 the Ministry of Mines and Energy published guidelines for a National Hydrogen Program (PNH2). Through PNH2, the government hopes to focus efforts on technology, capacity building, energy planning, legal frameworks, market competitiveness, and international cooperation. While Brazil does not have regulations on production and use of green hydrogen, at this stage, much of PNH2's focus is on performing feasibility and impact studies, boosting investment (including by adding hydrogen to successful infrastructure debentures and natural gas legal frameworks), and promoting cooperation between competing government agencies.

Chile

Chile has a large and mature renewable energy market, and its mineral resource-intensive economy provides a laboratory for "greener" mining technologies. Green hydrogen produced in the Atacama Desert and the southern Magallanes region is expected to achieve the lowest average cost of production globally by 2030, and the country aims to use this advantage to become a global hub for hydrogen production. Chile recently put in place its National Green Hydrogen Strategy, a comprehensive plan aimed at

promoting the development of green hydrogen projects in the country. The plan divides expected progress into staged objectives:⁸

- **2020 to 2025:** Ramp up domestically by prioritizing specific applications to build local supply chains and acquire experience, particularly: (i) oil refineries, (ii) ammonia, (iii) mining haul trucks, (iv) heavy-duty trucking, (v) long-range buses, and (vi) blending (up to 20%) hydrogen with natural gas into gas grids.
- **2025 to 2030:** Leverage the domestic base to scale into export markets through support for large-scale consortiums with offtake and investment commitments for green hydrogen and ammonia exports.
- **2030 onwards:** Exploit synergies and economies of scale to scale up and expand as a global supplier, and seek future applications of hydrogen, such as green ammonia in shipping and synthetic fuels in aviation, in order to consolidate its position in the market.

In line with this plan, in September 2021, Chile held the world's first green hydrogen tender for small-scale (10MW or greater) pilot projects to begin operating by the end of 2025.⁹ Even more recently, an international energy player announced a large-scale (up to 10 GW of installed wind capacity) green hydrogen project in Chilean Tierra del Fuego.¹⁰

Colombia

Colombia's northern coastal region has a large amount of as-yet-undeveloped capacity for wind power, and the country has recently shown political determination on low-carbon hydrogen. Its 30-year National Energy Plan 2020-2050 defines public policy objectives and initiatives for the Colombian energy sector, and it published (in cooperation with the Inter-American Development Bank's Energy and Climate Change and Sustainability Divisions) a Hydrogen Roadmap to define strategies to promote the development of low-carbon hydrogen, focused on (i) legal and regulatory measures, (ii) market mechanisms, (iii) support for the use of existing gas and energy infrastructure, and (iv) new technologies.¹¹ On the legislative front, in July 2021 Colombia's Congress passed an energy transition law establishing incentives for the development of green hydrogen, including tax breaks, import duties and exemptions. Ecopetrol, the national oil company, has conducted basic research on mixing hydrogen into natural gas pipelines and announced a green hydrogen pilot project.¹²

Mexico

Mexico has an abundance of wind, solar, and other renewable resources and a national gas infrastructure, but lacks regulation on green hydrogen. Its great dependence on fossil fuels for refining, heavy industry, and long-distance transport could provide a domestic market, and its geographical location and port infrastructure could allow Mexico to become an international supplier of hydrogen. Some projects have been announced, but larger investments are likely awaiting a change in the current political environment on renewables.

Peru

Recent studies indicate that the northern and southern regions of Peru are suitable to serve domestic and international demand for hydrogen,¹³ but Peru has not passed specific rules addressing the production or use of hydrogen. However, a bill of law was introduced to Peru's Congress in January 2021 aimed at encouraging investment in renewable resources and stimulating demand for green hydrogen.¹⁴ The proposed law would entrust the Ministry of Energy and Mines with developing a national green hydrogen

development plan with long-term policies regarding the use of hydrogen and establishing specific investment protections.

Key Takeaways

Following the adoption of the first national strategies and roadmaps for hydrogen, the largest economies in Latin America are gearing up for a race that will require the long-term engagement of all relevant stakeholders. From the investor's perspective, regulators should be focused on clarifying revenue streams to improve bankability and creating fiscal incentives. There is an opportunity for international sponsors and financing parties (in particular, multilateral agencies), and their advisors to engage with local authorities and stakeholders and come forward with specific proposals designed to foster investment.

Hydrogen relies on several technologies that are currently available but require the necessary pricing support to deploy at scale, which will require timely bespoke government policies. Early financing and mitigation of investment risks, public-private partnerships, and loans from national and multilateral development banks, as well as blended finance instruments, could help fund the first projects and put the sector on track.

Sovereign risk is always a challenge in the region. Risk enhancement by multilateral and export credit agencies will have to be considered going forward. Early coordination with the financial sector — to form an understanding of how hydrogen projects work, how different risks can be mitigated, and so on — is critical to ensuring that the supply of finance does not become a bottleneck for the smooth implementation of project pipelines.

Annex: Low-Carbon Hydrogen Projects to Watch in Latin America

Country	Project	Principal Sponsors	Expected Annual Production*	Expected COD	Renewable Energy Source	End use
Argentina	Sierra Grande ^(a)	Fortescue Future Industries	35k tons H ₂ (phase 1) 215k tons H ₂ (phase 2)	2024 (phase 1) 2028 (phase 2)	Wind	Export
	Bahía Blanca ^(b)	Integración Energética S.A. and Fraunhofer Institute	Unknown	Unknown	Wind	Local and export
Brazil	Pernambuco Green Hydrogen Hub (Port of Suape) ^(c)	Iberdrola (through Neoenergia)	Unknown	Unknown	Unknown	Unknown
		Qair Brasil	296k tons H ₂	Unknown	Wind (onshore and offshore)	Unknown
	Ceará Green Hydrogen Hub (Pecém Port Complex) ^(d)	Fortescue Future Industries	Unknown H ₂	Unknown	Solar, offshore wind	Unknown
	Base One (Pecém Port Complex) ^(e)	Enegix Energy, Black & Veatch	660k tons H ₂	2025	Solar, onshore wind	Export
	Açu Superport ^(f)	Fortescue Future Industries	250k tons NH ₃	Unknown	Solar, onshore wind	Unknown
Chile	Haru Oni e-Fuels ^(g)	Andes Mining and Energy, Siemens, Enel, ExxonMobil, Porsche	130k L e-fuel (phase 1) 55M L e-fuel (phase 2) 550M L e-fuel (phase 3)	2022 (phase 1) 2024 (phase 2) 2026 (phase 3)	Wind	Synthetic fuels
	HyEx Green Ammonia ^(h)	Engie, ENAEX	130k tons NH ₃	2025 (phase 2)	Solar	Mining, some export
	H2 Magallanes ⁽ⁱ⁾	Total Eren	4.4M tons NH ₃	Unknown	Wind	Local and export
Mexico	Neptuno Solar 1 ^(j)	Neptuno Solar	18k tons H ₂	Unknown	Solar	Power sector

* All production amounts are indicative figures sourced from public announcements and reporting.

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