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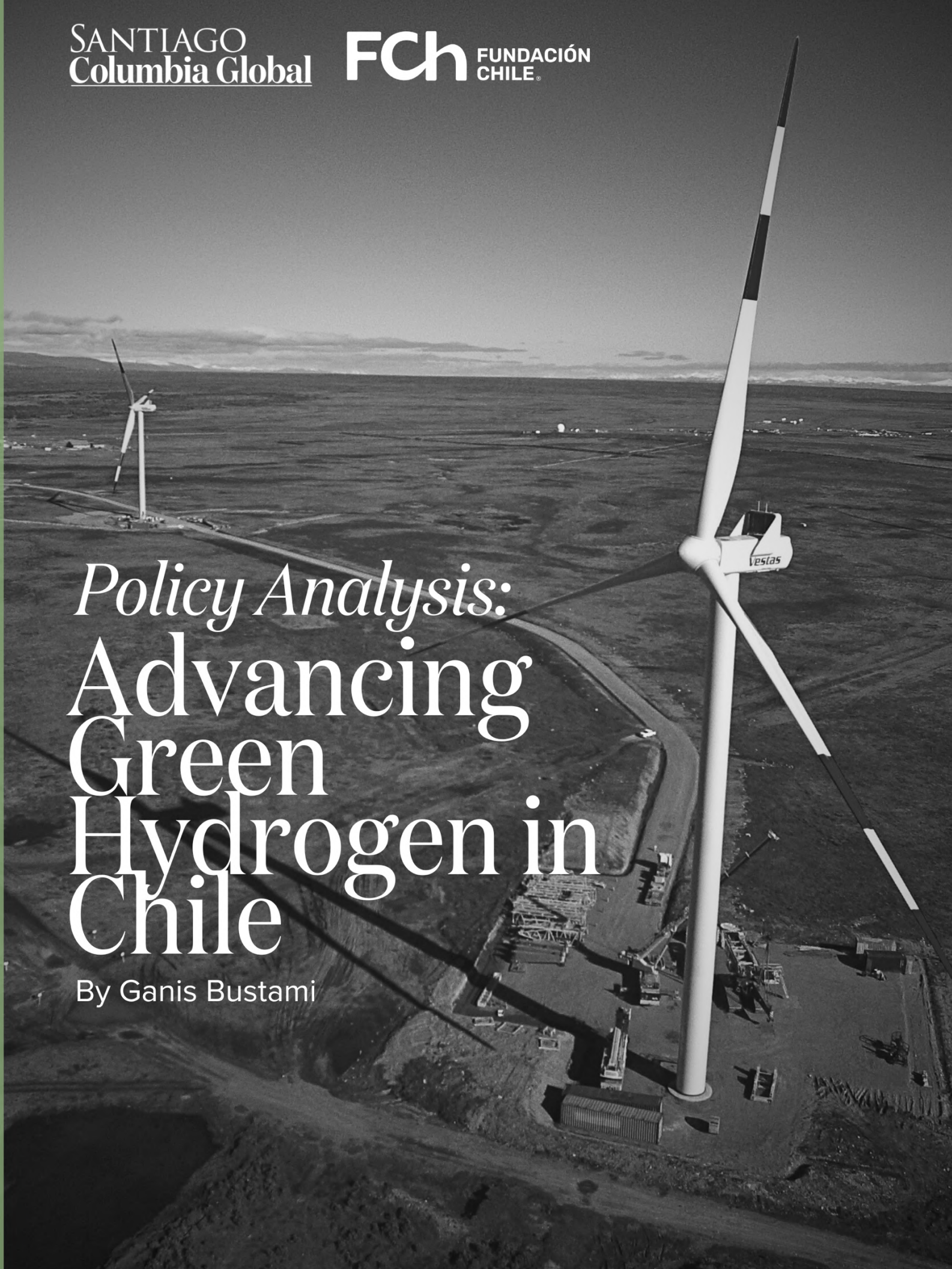

Policy Analysis:

Advancing Green Hydrogen in Chile

By Ganis Bustami

Advancing Green Hydrogen in Chile: Policy and Financial Pathways for Magallanes

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Chile has positioned itself as a key player in the global energy transition, leveraging its vast renewable energy resources and critical minerals such as lithium and copper. The country's 2022 Framework Law on Climate Change sets the ambitious goal of achieving carbon neutrality and climate resilience by 2050, driving the need for innovative and scalable clean energy solutions. Green hydrogen has emerged as a cornerstone of this strategy, with Chile's National Green Hydrogen Strategy outlining its role in decarbonizing hard-to-abate sectors and the Green Hydrogen Action Plan 2023-2030 serves as a complementary document to the National Strategy, guiding the deployment of green hydrogen (Chilean Ministry of Energy, 2024).

Within this framework, the Magallanes and Antártica Chilena region stands out as a strategic hub for local development of green hydrogen and export of green energy, benefiting from world-class wind energy potential, growing investments, and robust public-private collaboration. Its exceptional renewable energy resources position it as a leader in the global green hydrogen revolution, with public and private sector cooperation, including the Transforma H2v Magallanes Regional Program, CORFO, Magallanes Regional Government, and ChileGlobal Ventures. Collaborative actions in promoting the potential of green hydrogen in Magallanes are essential, especially in developing innovative financing mechanisms to address economic challenges in scaling up these projects. This analysis explores the region's development, prospects, and creative financing to unlock its full potential.

State of the Green Hydrogen Market in Magallanes

Magallanes holds significant potential for green hydrogen production primarily due to its exceptional wind resources. A wind power plant in the southernmost region in Chile can exceed capacity factors of up to 60%, rivaling offshore wind globally (Boese Cortés & Soto, 2023). These conditions potentially enable cost-effective hydrogen production, making the region central to Chile's green hydrogen landscape. Chile's National Green Hydrogen Strategy estimates that 24% of its emissions reduction by 2050 will come from renewable hydrogen, supported by significant investments and pilot projects (Ministerio de Energía, 2020). However, high capital costs, logistical challenges, infrastructure constraints, permitting processes, and capacity development limitations remain barriers (Chilean Ministry of Energy, 2024).

Future Development Prospects in the Region

The Magallanes Region in Chile exemplifies a strategic pivot towards a sustainable energy future, leveraging its unique environmental conditions to position itself at the forefront of the global green hydrogen market. Magallanes is poised to become a key hydrogen exporter, with projections estimating a $24 billion annual market by 2050 (Boese Cortés & Soto, 2023). By 2030, this region and the Atacama Desert will produce the cheapest green hydrogen globally, capitalizing on these remote areas' abundant and mighty solar and wind resources. This strategic advantage is highlighted by projected reductions in levelized costs of green hydrogen production, from 1.7 USD/kg H_2 in 2020 to as low as 0.8 USD/kg H_2 by 2050 (Ministerio de Energía, 2020).

The transformation of Magallanes into a hub for green hydrogen production reflects a significant economic opportunity and aligns with global decarbonization goals. McKinsey & Company and the International Energy Agency underscore the region's capacity to potentially produce 160 million tons of green hydrogen annually, setting the stage for substantial contributions to both domestic use and international exports. Such development is expected to drive technological advancements in electrolyzers and renewable power, further reducing production costs and enhancing competitive market positioning (Ministerio de Energía, 2020).

As set out in the National Strategy that aims to transform Chile into a world leader in producing and exporting green hydrogen, this new pole of progress for the country will potentially imply the creation of some 100,000 jobs and US$200,000 million in investment over the next 20 years (Enagás, 2021). As Magallanes is a center of renewable energy potential and green hydrogen production, the government is creating workforce development programs that could prepare local communities for this opportunity, specifically in construction, logistics, and operations – for example, Magallanes Technology Center for Green Hydrogen Innovation, that is identified from the work carried out by Transforma Magallanes program (Chilean Ministry of Energy, 2024) and will be led by Fundación Chile with the support of partners like the Technical Research Centre of Finland (VTT). Moreover, similar to the U.S. Justice40 Initiative, equity-focused policies could ensure the inclusive distribution of hydrogen's economic benefits (US National Clean Hydrogen Strategy, 2023). By prioritizing infrastructure in underserved areas, Magallanes can solidify its role as a sustainable growth engine for Chile.

In sum, Magallanes is poised to become a critical node in the global green energy production network, fostering significant economic, environmental, and social transformations within Chile and offering a model for sustainable development worldwide.

Creative Financing

Magallanes' competitive Levelized Cost of Hydrogen (LCOH) enhances its global appeal. Costs are projected to drop to $0.8–$1.1 per kilogram by 2050 (Boese Cortés & Soto, 2023), rivaling U.S. targets of $1 per kilogram by 2031. These figures reinforce the region's leadership potential (US National Clean Hydrogen Strategy, 2023). However, the fact that global consumers of Chile's potential green hydrogen production are located far away from Magallanes is a challenge that will impact the growth of this market. Given the immaturity of the green hydrogen sector locally and globally, early-stage projects have high investment requirements and significant risk, making a de-risking mechanism necessary.

Green hydrogen projects require substantial investment and involve considerable financial risks to unlock this potential. The assessment of metrics such as Net Present Value (NPV) and Internal Rate of Return (IRR) is currently being discussed to evaluate

project financial viability. At the same time, minimizing capital costs, particularly through a lower Weighted Average Cost of Capital (WACC), is essential (Investopedia, n.d.). Public-private partnership financing, such as a blended finance mechanism, can accelerate and enable more green hydrogen production development. Combining public and private funding to de-risk early-stage projects, aligning disbursements with project progress while offering potential investors the most appealing NPV, IRR, and WACC will create a level playing field for the market to grow this relatively new industry.

Globally, countries like South Africa, Indonesia, and Namibia are employing blended finance mechanisms to advance their green hydrogen initiatives. South Africa's SA-H2 Fund integrates public and private investments to develop its green hydrogen sector, focusing on decarbonizing industrial sectors and boosting economic growth (Government of South Africa, 2023). In Indonesia, the SDG Indonesia One fund supports sustainable infrastructure projects, including potential future investments in green hydrogen, through a blend of international and domestic financing (Tri Hita Karana Forum, n.d.). Meanwhile, Namibia’s SDG Namibia One aims to utilize the country's renewable resources to become a leader in green hydrogen, backed by substantial European investment and focused on creating a hydrogen valley that will significantly contribute to the nation's energy self-sufficiency and economic development (Development Bank of Southern Africa, 2023). These efforts highlight the strategic use of blended finance to mitigate investment risks and leverage public and private capital for large-scale green hydrogen projects.

To replicate these successful models in Chile, it is essential to develop blended finance instruments that can de-risk early-stage green hydrogen projects and attract large-scale private investment. A key component of this approach should be the establishment of concessional funding mechanisms, led by CORFO and supported by multilateral financial institutions such as the Inter-American Development Bank (IDB) and the Development Bank of Latin America and the Caribbean (CAF). These funds could provide first-loss capital, guarantees, or subordinated debt structures that lower the risk profile of projects, making them more attractive to institutional investors. By leveraging these public and multilateral resources, Chile could mobilize significant private capital from ultra-high-net-worth individuals (UHNWI) and institutional investors, including pension funds, which typically seek long-term, stable returns. Additionally, a well-structured financial framework should focus on helping projects

transition from the development phase to the construction phase, ensuring they reach Final Investment Decision (FID). This could be achieved through project preparation facilities, viability gap funding, and risk-sharing mechanisms that address key hurdles such as permitting delays, infrastructure bottlenecks, and long-term offtake agreements. Strengthening this transition would provide the necessary certainty for investors and accelerate the deployment of green hydrogen infrastructure, positioning Chile as a leader in the global energy transition while fostering sustainable economic development in regions like Magallanes.

In conclusion, Magallanes stands at the forefront of the global green hydrogen economy, owing to its exceptional wind resources, robust policy environment, and innovative financing mechanisms. By embracing regional hub models and equity-focused policies, the region not only aligns itself with international best practices but also stimulates local economic development. Furthermore, the pivotal role of creative financing emerges as a crucial element in addressing development challenges, enabling collaboration and investment that are vital for realizing the transformative potential of green hydrogen as a fundamental component of the future clean energy landscape.

References

Boese Cortés, I., & Soto, I. (2023). *Renewable hydrogen in Latin America and the Caribbean: Opportunities, challenges, and pathways*. Asociación Chilena de Hidrógeno.

Chilean Ministry of Energy. (2024, April 25). Green Hydrogen Action Plan. Retrieved from https://energia.gob.cl/sites/default/files/documentos/green-hydrogen_action-plan.pdf

Clean Power. (2024). *Wind power: Facts and statistics*. Clean Power. Retrieved from https://cleanpower.org/facts/wind-power

Development Bank of Southern Africa. (June, 2023). *SDG Namibia One*. Development Bank of Southern Africa

Enagás. (2021, March 18). Chile, a country ready for the green hydrogen economy. Good New Energy. Retrieved From

https://goodnewenergy.enagas.es/en/innovative/chile-a-country-ready-for-the-green-hydrogen-economy-2/

Fundación Chile. (2024). *ChileGlobal Green Hydrogen Impact Fund Plan* [Unpublished manuscript]. Fundación Chile.

Fundación Chile. (2024, November 23). Fundación Chile and VTT will work together on Green Hydrogen Technology Center in Chile. Retrieved from https://fch.cl/en/news/fundacion-chile-and-vtt-will-work-together-on-green-hydrogen-technology-center-in-chile/

Government of South Africa. (n.d.). *President Cyril Ramaphosa welcomes closer cooperation with European partners*. Retrieved from https://www.gov.za/news/media-statements/president-cyril-ramaphosa-welcomes-closer-cooperation-european-partners-21

Investopedia. (n.d.-a). *Weighted average cost of capital (WACC)*. Investopedia. Retrieved from https://www.investopedia.com/terms/w/wacc.asp

Investopedia. (n.d.-b). *Net present value (NPV)*. Investopedia. Retrieved from https://www.investopedia.com/terms/n/npv.asp

Investopedia. (n.d.-c). *Internal rate of return (IRR)*. Investopedia. Retrieved from https://www.investopedia.com/terms/i/irr.asp

Ministerio de Energía. (2020, November). National green hydrogen strategy - Chile. Gobierno de Chile. Retrieved From https://energia.gob.cl/sites/default/files/national_green_hydrogen_strategy_-_chile.pdf

Transforma Regional Program H2V Magallanes. (2024, August 27). *Deck Transforma Regional Program H2V Magallanes*. Punta Arenas.

Tri Hita Karana Forum. (n.d.). *SDG Indonesia One / SDG Bond*. Retrieved from https://www.thkforum.org/thk-initiatives/sdg-indonesia-one-sdg-bond/

U.S. Department of Energy. (2023). *U.S. National Clean Hydrogen Strategy and Roadmap: Executive Summary*.