Consultancy Services for Technical Assistance Activity: Recommendations for a Green Hydrogen Certification Scheme in Chile that is compatible with national and international carbon markets

FINAL PRESENTATION

Prepared for:

THE WORLD BANK

Ministerio de Energía
Gobierno de Chile

BRUSSELS • **BOGOTA** • BUENOS AIRES
PARIS • SANTIAGO • BEIJING

April 2021

GENERAL OBJECTIVE OF THE ASSIGNMENT

Provide **recommendations and required steps**, including the feasibility, value, and actions required, to **establish a green hydrogen certification scheme in Chile**, including the monitoring, reporting and verification (MRV) framework and traceability methodologies, actors involved, governance framework and ways the scheme could be validated in the national and international carbon and green hydrogen markets.

The project was executed by a consortium comprised of team members from HINICIO and Ludwig-Bölkow-Systemtechnik (LBST)

Specific Objectives

- Carry out a **comprehensive review and benchmark of the state of the art and trends of international practices on low-carbon and green hydrogen certification**, with a focus on opportunities and challenges for implementation in Chile

- Organize and execute a series of **workshops with national stakeholders to discuss the need for, requirements and value of a green hydrogen certification scheme in Chile**

- **Provide well informed and justifiable recommendations for the development of a green hydrogen certification scheme in Chile** that is compatible with international markets as well as with the national and international demand of carbon emission reductions, including the existing MRV system in place

FOUR DELIVERABLES COMPRISE THE WORK CARRIED OUT BY THE CONSORTIUM

Deliverable 1: Work Plan

- Delivered 12/2020
- Contains the approach, methodology, and timeline for the execution of the project

Deliverable 2: Benchmark of international practices

- Delivered 01/2021
- Provides a benchmark of the state and trends of international practices on low-carbon and green hydrogen certification, including an analysis of opportunities and implementation challenges of the most relevant schemes or mechanisms identified

Deliverable 3: Workshops and Interviews

- Delivered 03/2021
- Presents the results for three national workshops with relevant stakeholders along the H2 value chain as well as eight bilateral in-depth interviews with selected experts of both national (4) and international (4) institutions

Deliverable 4: Advisory Report

- Delivered 04/2021
- Contains the final conclusions and recommendations of the assignment to support the Government of Chile in implementing a green hydrogen certification scheme for Chile

1 Work Plan

Key Outcomes

0		**Project Setup** *Setup of the project, kick-off, and overall administration of tasks, teams, and timeline*
1		**Benchmark of international practices on low-carbon and green H2 certification mechanisms** *Review of international experiences and recommendations for Chile based on the state of the art*
2		**Workshops and interviews with public and private stakeholders** *Strategic engagement with national stakeholders to gather inputs for certification steering*
3		**Advisory report on the development of a green H2 certification scheme in Chile** *Comprehensive report on recommendations for a scheme applicable to Chile + Roadmap Proposal*

Methodological Approach

- The assignment was divided across four Work Packages, each with an associated deliverable
- Each work package contains a set of tasks aimed at completing the specific objective laid out per deliverable

WP0 – Project Setup

Work package leader: Hinicio

0 — **Project Setup**
Setup of the project, kick-off, and overall administration of tasks, teams, and timeline

- **0.1** — **Project Admin**
  Various Project Admin duties to ensure smooth workflow
- **0.2** — **Kick-Off**
  Holding a kick-off meeting to start activities and align on delivery
- **0.3** — **KOM Minutes and Work Plan**
  Submit a MoM for the kick-off meeting and a project work plan

ASSOCIATED DELIVERABLES

- Deliverable 1: Project Work Plan
- To be delivered 5 days after the start of the assignment

WP1 – Benchmark of international practices

Work package leader: LBST

1 

Benchmark of international practices on low-carbon and green H2 certification mechanisms
Review of international experiences and recommendations for Chile based on the state of the art

1.1 **Analysis of Certification Schemes: Californian LCFS, CertifHy, TÜV SÜD, AU, JP, SK, CEM/IPHE**
Comprehensive benchmarking on international schemes

1.2 **Specific case studies**
Preparation of 2 case studies on the most relevant schemes as identified in consultation with the client

ASSOCIATED DELIVERABLES

- Deliverable 2: Benchmark of international practices on low carbon and green H2 certification mechanisms
- To be delivered 3 weeks after the start of the assignment
- **Note:** due to Christmas holidays, we propose to deliver a draft report by late December, receive feedback by early January and finish the deliverable by mid-January

WP2 – Workshops and interviews with stakeholders

Work package leader: Hinicio

2 

Workshops and interviews with public and private stakeholders
Strategic engagement with national stakeholders to gather inputs for certification steering

2.1	**Workshop logistics and organization** *Prepare for 3 workshops to discuss the need for, requirements and value of a green H2 certification scheme in Chile*
2.2	**Workshop methodology and materials preparation** *Define a methodology that allows for the accomplishment of goals and desired outcome*
2.3	**Workshop facilitation** *Carry out the 3 workshops with key stakeholders*
2.4	**Four Interviews with Chilean Stakeholders** *Bilateral conversations with four key national actors*
2.5	**Four Interviews with International Organizations** *Bilateral conversations with four international organizations relevant to the certification scheme landscape*

ASSOCIATED DELIVERABLES

- Deliverable 3: Workshop Report and summary of key stakeholders' interviews
- To be delivered 5 weeks after the start of the assignment

WP3 – Advisory report

Work package leader: Hinicio

3 

Advisory report on the development of a green H2 certification scheme in Chile
Comprehensive report on recommendations for a scheme applicable to Chile + Roadmap Proposal

- **3.1** **Desk research on MRV systems to certify GHG emission reductions in Chile**
  Review the existing and applicable MRV (Measurement, Report, Verification) system used by Chile
- **3.2** **Description of attributes to monitor and measure**
  Define which attributes for green H2 should be scoped within the scheme
- **3.3** **Challenges and opportunities to certify "green products“**
  Outline at a high-level the foreseen challenges and opportunities for Chile in future exports for other green products
- **3.4** **Actors to be involved**
  Proposed stakeholder map and governance structure for the scheme
- **3.5** **Preliminary recommendations for Chile**
  Provide a set of guidelines and recommendations for the development or adoption of a certification scheme
- **3.6** **Roadmap of actions**
  Roadmap of activities and actions needed in a specific timeframe to have a fully functional certification scheme

WP3 – Advisory report

Work package leader: Hinicio

ASSOCIATED DELIVERABLES

- Deliverable 4: Advisory Report: Recommendations for the development of a green H2 certification scheme in Chile that is compatible with international markets
- To be delivered 12 weeks after decision on the chosen program design option

Timeline

WP	Task	Task description	1 14-Dec	2 21-Dec	3 28-Dec	4 4-Jan	5 11-Jan	6 18-Jan	7 25-Jan	8 1-Feb	9 8-Feb	10 15-Feb	11 22-Feb	12 1-Mar	13 8-Mar
			December				January					February			March
0		**Project Setup**													
	1.1	Project Admin													
	1.2	Kick-Off													
	1.3	MoM and WP		D1A											
1		**Benchmark of international practices on low-carbon and green H2 certification mechanisms**													
	1.1	Analysis of Certification Schemes: Certifhy, TUV SUD, Californian LCFS, CEM/IPHE, Australia, Japan and Korea													
	1,2	2 Specific case studies													
	1,3	Deliverable preparation and adjustments post-revision													
	1,4	Deliverable presentation		FUP	D2										
2		**Workshops and interviews with public and private stakeholders The consultant**													
	2.1.	Workhops logistics and organization													
	2.2.	Workshop Methodology and materials preparation													
	2.3.	Workshops facilitation (3 x 0.5d)													
	2.4.	4 Interviews with Chilean stakeholders													
	2.5.	4 interviews with international organizations													
	2.6.	Deliverable preparation and adjustments post-revision													
	2.7.	Deliverable presentation							FUP	D3					
3		**Advisory report on the development of a green H2 certification scheme in Chile that is compatible with international markets, including corresponding roadmap proposal**													
	3.1.	Desk research on MRV systems to certify GHG emission reductions in Chile													
	3.2.	Description of attributes to monitor and measure													
	3,3	Challenges and opportunities to certify "green products"													
	3,4	Actors to be involved													
	3.5.	Preliminary recommendations for Chile													
	3,6	Roadmap of actions													
	3,7	Deliverable preparation and adjustments post-revision													D4
	3,8	Final presentation												FUP	FP

D# Deliverable **FP** Final Presentation **FUP** Follow-up meeting

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Consultant Team

Composed of Professionals from both Hinicio and LBST

2 International Benchmark

Key Outcomes

Four existing hydrogen certification systems with international recognition were benchmarked

	Low Carbon Fuel Standard	CertifHy	TÜV SÜD	Australia
Year of establishment	2011	2019	2011	planned for the next years
Public or private	Public/ governmental	private	private	Public/ governmental
Geographic scope	California, USA	Focus on European Economic Area; to be extended internationally	Focus on Germany; but applicable internationally	Australia (for international trade of hydrogen)
Objective	Compliance with legal requirements	Consumer disclosure; to be extended to compliance with legal requirements in EU	Consumer disclosure (voluntary certification)	Support international trade
Governance	California Air Resources Board	Stakeholder Platform	TÜV SÜD	Not specified yet
Verification	Third-party verification for fuel pathways, otherwise: carried out by CARB	Certification bodies (third party; so far only TÜV SÜD recognized by CertifHy)	Carried out by TÜV SÜD or other certification bodies, who have a valid accreditation for certifications of products	Not specified yet
Quantification of emissions through	CI standard	Guarantee of Origin scheme for Green & Low Carbon Hydrogen	Green Hydrogen standard	Distinction of three types of emission scopes

California LCFS (1/3)

Defining Characteristics

GENERALITIES

- Implementation started in 2011 based on a regulation adopted in 2009
- Designed to encourage the use of cleaner low-carbon transportation fuels in California
- LCFS standards are expressed in terms of the "carbon intensity" of gasoline and diesel fuel and their respective substitutes

POLICY DEFINITIONS

- Started with the goal to reduce the carbon intensity of transportation fuels used in California by at least 10 percent by 2020 from a 2010 baseline
- The California Air Resources Board (CARB) has relaxed legislation so that the reduction target of 10 percent must be met by 2022 rather than 2020
- Applicability of the LCFS was extended to 2030

GOVERNANCE

- CARB is the overall ruling authority and defines the governing rules of the LCFS
- Since 2019, third-party verification of fuel pathway applications as well as of ongoing reporting of CI calculations and documentation is possible. The verification services are performed by qualified and trained verifiers
- All projects must submit an annual compliance report, which must include information on any storage re-evaluation or corrective action undertaken
- All submitted reports must be verified by an approved verification body which is required to review all plans, assessments and reports, and to summarize their findings in a verification report

California LCFS (2/3)

Defining Characteristics

IMPLEMENTATION

- In general, all petroleum fuel producers, importers, refiners and wholesalers selling fuel in California are subject to the LCFS and must meet each year's CI standard established by CARB
- Fuels that have a CI lower than the target generate LCFS credits, whereas one credit represents one metric ton of carbon dioxide equivalent reduced. Fuels that have a CI higher than the target generate deficits, whereas one deficit represents one metric ton of carbon dioxide equivalent above the target LCFS credits do not expire
- A fuel producer with deficits must have enough credits through generation and acquisition to be in annual compliance with the standard. Credit owners can only sell their credits to deficit holders. Credit trade is only allowed among regulated parties
- There are three ways to generate credits in the LCFS:
  - **Fuel pathways:** Providers of low carbon fuels used in Californian transportation generate credits by obtaining a certified CI on their used fuel and reporting transaction quantities on a quarterly basis.
  - **Project-based:** Projects are defined as actions reducing GHG emissions in the petroleum supply chain as for example carbon-capture-and-sequestration projects do. Crediting for projects is based on life cycle emission reductions.
  - **Capacity-based:** The 2018 amendments added a new crediting mechanism, which is designed to support the deployment of Zero Emission Vehicle (ZEV) infrastructure. Crediting for ZEV infrastructure is based on the difference between the capacity of the hydrogen station or electric vehicle fast charging site and the actual fuel dispensed. Thus, the number of credits awarded for installing hydrogen fuel infrastructure declines as sales increase.

California LCFS (3/3)

Defining Characteristics

COVERAGE

- Geographic scope is limited to the state of California, where it specifically focuses on the transportation sector, where it encourages the transformation of the production as well as the use of fuels.
- Suppliers of fuels deemed to have CI below the standard CI through to 2030 are excluded from the obligation regulated in the LCFS.
- Fuels used for military vehicles, locomotives, ocean-going vessels (not applicable to recreational or commercial harbor craft) and aircraft as well as fuel suppliers whose combined fuel production is below 420 Million MJ per year are not covered by the LCFS
- Other jurisdictions are joining the LCFS; this is evident in the Pacific Coast Collaborative, which is a regional agreement between California, Oregon, Washington, and British Columbia (Canada), to strategically align policies to reduce GHG emissions, and promote clean energy. CARB has been routinely working with these jurisdictions
- Over time, these programs are supposed to build an integrated West Coast market for low-carbon fuels that are expected to create greater market pull and synergistic implementation and enforcement programs.
- Furthermore, there is engagement with representatives from Canada and Brazil as they develop similar clean fuels program

CertifHy(1/3)

Defining Characteristics

GENERALITIES

- Financed by the Fuel Cell and Hydrogen Joint Undertaking (FCH JU), a public-private partnership with the European Commission
- Serves as a catalyst for establishing and implementing an EU-wide Guarantee of Origin (GO) scheme for Green & Low Carbon Hydrogen
- CertifHy applies a book & claim approach

POLICY DEFINITIONS

- CertifHy GO's are compliant with RED II Art. 19(7)
- Developing a system that integrates GOs as well as certificates that can be used for target compliance is a major value proposition of the current CertifHy phase for the scheme's future implementation
- CertifHy seeks recognition by AIB to become an EECS® Compliant Issuing Body (IB)

GOVERNANCE

- CertifHy governs itself in the form of a Stakeholder Platform. This platform brings together a large number and wide range of stakeholders
- Currently, nearly a thousand members, inter alia from the private sector, associations and NGOs are part of this platform
- The platform consists of three main bodies: the steering group, four working groups and the secretariat
- The GO scheme structure is comprised of National Competent Authorities, the Stakeholder Platform, Certification Bodies, the Issuing Body, the CertifHy Registry, and Account Holders

CertifHy(2/3)

Defining Characteristics

IMPLEMENTATION

- As of January 2019, CertifHy had issued 75000+ CertifHy Green and Low Carbon Hydrogen GOs that are available on the market
- While the project has so far developed a Scheme for Guarantees of Origin, the objective of the next, currently running phase ('CertifHy 3') is to expand the CertifHy system for handling both GOs and Supply Certificates. Part of the overarching ambition for CertifHy's third phase is to create an EU-wide CertifHy Certification Scheme that covers both Guarantees of Origin and Supply Certificates for target compliance
- For GOs, the focus is on the origin of the energy input, and the GHG balance of the production including upstream emissions. For Supply Certificates, RED II foresees additional criteria, among others extending the GHG balance from hydrogen production over the full supply chain until the point of consumption
- Experiences with GOs so far indicate that it is difficult to foresee or predict the market value of GOs for energy carriers, such as renewable electricity, [hydrogen,] methane or heat. As GOs serve the purpose of consumer disclosure, it is the balance of demand and supply that sets the price. Also, GO prices are notoriously non-transparent: there is no common trading platform for them in which price developments can be monitored easily
- Establishing the CertifHy scheme was done in two phases. In phase one, a research project was carried out ("CertifHy 1") over a two-year period funded by the FCH JU with an overall budget of 551,609 € and an EU funding contribution of 432,552.53 €. Phase 2 of CertifHy ("CertifHy 2") was initiated in October 2017 and was finalized in March 2019 with the launch of the scheme. It had a total budget of 598,879 € for a period of one and a half years. Phase 3 of CertifHy to create an EU-wide Certification Scheme that covers both Guarantees of Origin and Supply Certificates for target compliance, to support and accelerate the establishment of harmonized and mutually recognized Guarantees of Origin Schemes across EU Members States, and further objectives, has a total budget of 1.499 million € for a period of three years

CertifHy(3/3)

Defining Characteristics

COVERAGE

- Europe is leading on the development of a hydrogen certification standard, through CEN
- There is a strong consensus amongst stakeholders that there is a need for harmonization action now so that a fragmented H2 GO market is avoided. CertifHy will provide input to the International Partnership for Hydrogen and Fuel Cells in the Economy (IPHE) work group on hydrogen certification to ensure a harmonization between EU and the international methodology being shaped
- While the current geographic scope is defined as the European Economic Area (EEA) including the European Union plus additional European countries, future plans include exploring the possibilities of imports and export of GOs with countries outside of the EEA
- RED II Art 19(11) foresees this provided that direct import/export of energy takes place and that the EU has made an agreement with the country regarding mutual recognition of the GOs. The agreement between the EU and a third country in practice will require the existence of a GO system similar to the one defined by RED II in that third country
- As part of phase 3, CertifHy will design and seek to test the technical means to allow for imports and exports of GOs including relevant data fields supporting proof of sustainability and mass balancing. Fostering international harmonization is a core objective of CertifHy

TÜV SÜD

Defining Characteristics

GENERALITIES

- TÜV SÜD has established a private Green H2 standard and certification system that can, in principle, be applied worldwide, but has a focus on Germany and Europe
- It offers a few options including using book & claim (as for GOs) or mass balancing for physical H2 delivery with green hydrogen certification
- TÜV SÜD Green Hydrogen offers three alternative options to conform with additionality requirements related to renewable electricity used for hydrogen production:
  - **Share of new installations:** Electricity from renewable sources has a share of 30 % from new facilities, which started their operation within the last 36 months.
  - **Technology mix:** Electricity from renewable sources has a share of either 15% hydropower from plants <2 MW or 30% wind power or 5% solar, geothermal or biomass/biogas power from plants <2 MW. These plants must have been put into operation after 01/01/2020.
  - **Funding:** 0.2 ct/kWh of used electricity in the green hydrogen production are paid to a fund for projects promoting renewable energies, efficiency, innovation and compensation.
- The standard applies to hydrogen consumption in the following applications and sectors: hydrogen as (chemical) feedstock, transport, or electricity storage (including hydrogen injection into the natural gas grid)
- TÜV SÜD has also contributed to the development of CertifHy, and considers its own standard as providing requirements (e.g. on mass balancing) that go further than the (book & claim) CertifHy scheme, and can be carried out on top of CertifHy certification

Australia

Defining Characteristics

GENERALITIES

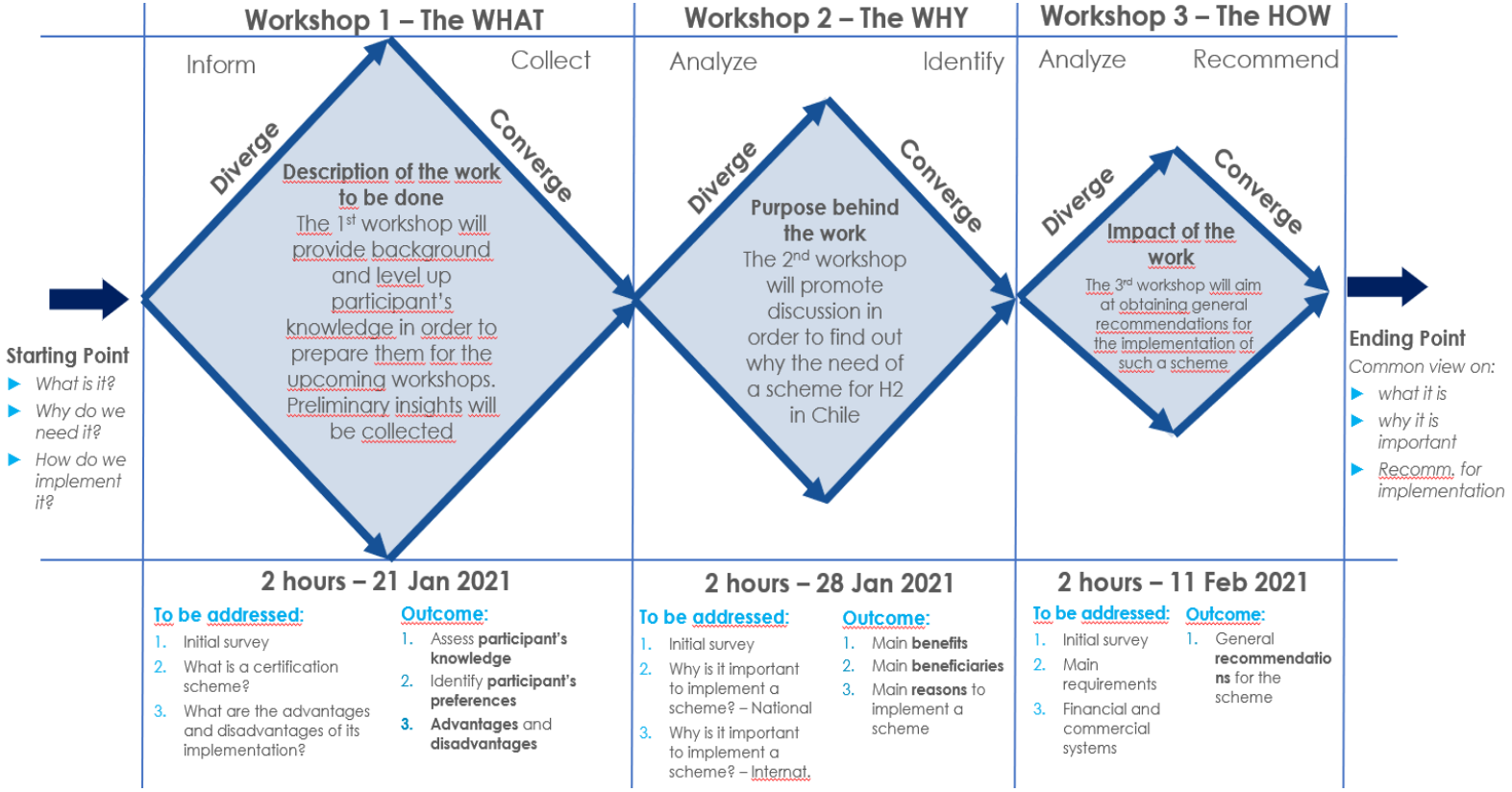
- In June 2020, the Australian Department of Industry, Science, Energy and Resources closed a consultation on its proposal to develop an international certification scheme to classify hydrogen produced in Australia according to its environmental impact
- The Australian government proposes an initial international certification scheme to track production technology, scope 1 and scope 2 carbon emissions, and production location
- The National Greenhouse and Energy Reporting (NGER) scheme of Australia is a national framework for reporting and disseminating company information about greenhouse gas emissions, energy production, energy consumption and other information, which requires estimation and reporting of scope 1 and scope 2 . Thus, basing an Australian hydrogen certification scheme on scope 1 and scope 2 emissions would make it consistent with the NGER

3

Workshops & Interviews

Key Outcomes

In order to bring together critical views from different sectors and actors, three workshops were carried out, organized around 3 axes of discussion



- Hinicio invited 55 stakeholders to designate a representative to bring their vision and participate in the workshops
- All sessions were 2 hours long
- Interactive methodologies using polling and MURAL tools were used to gather insights

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Eight one-hour Bilateral Interviews were conducted to gain in-Depth insights

National institutions interviewed

- Chilean Mining Council (*Consejo Minero*)
- H2 Association Chile
- The Ministry of Environment (MMA) of Chile (2 interviews)
- ProChile (Division of the Chilean Ministry for Foreign Affairs)

International institutions interviewed

- Hydrogen Council (HC)
- Porsche A.G. Germany
- German Energy Agency (DENA)
- California Hydrogen Business Council (CHBC)

Interview with the Chilean Mining Council

Central Statements

- The willingness of the Chilean Mining companies to pay an additional price for certified hydrogen (or its derivates) will depend on the requirements of global mineral buyers.
- The large-scale mining companies' members of the Mining Council have determined significant emission reduction targets, the majority of them until 2030, and some of them aspire to be carbon neutral until 2050 (please refer to table 1 in Annex II).
- The demand of green mining products (copper) is expected to grow, but no specific consumers have been identified so far.
- So far, and in the absence of an official certification system for renewable generation sources underpinning electricity supply contracts, mining companies rely on private certifications offered by electricity utilities. An interesting path in this context is the "Copper Mark validation », which covers various environmental and social performance variables.

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CONSEJO MINERO

NATIONAL

Interview with the Chilean Hydrogen Association

Central Statements

- A main benefit of a H2 certification system for Chile with a solid centralized database can help to improve public [climate] policies by better targeting and correction based on information and thus support meeting the NDCs.

- "Certification" should not be confused with "label": A "certificate" is a tangible easily verifiable fact, while labels are opinions which are not easily verifiable (eg. H2 produced in a place with no indigenous land issues); labels are additional qualities added to the hydrogen, the focus should be on certification first.

- The rules are set by the market, not by the producer. The goal should always be the compliance with the NDC, the reduction of emissions.

- The Government should define principles, not rules; there is no need for a regulatory framework for this, as the market regulates it.

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H_2 Chile
ASOCIACIÓN CHILENA DE HIDRÓGENO

NATIONAL

Interview with the Chilean Ministry of Environment

Central Statements

- Huella Chile is a voluntary reporting system of GHG emission mitigation actions generated by an organization that are recognized for 5 years (after that period, the technology becomes the baseline of the operation; this way technological innovation is considered). Evaluation of emission reductions is per project, not per organization. Reduction accounting is a parallel MRV to emissions accounting.

- The Capacity Building Initiative for Transparency (CBIT), an UN-environmental fund, is currently developing guidelines for a national MRV. Adjustments need to be made between the 3 programs - Huella Chile, the CBIT MRV guidelines and the national emissions inventory - to integrate them into one national accounting framework.

- Carbon neutrality is proposed in emissions, it is an emission offset. This is different from an inventory of mitigation actions.

- It is important to avoid a leakage of emissions: when exporting renewable H2, the reductions are kept by a third party, the buyer. The national emissions inventory would have to be adjusted in these cases.

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Ministerio del Medio Ambiente

Gobierno de Chile

NATIONAL

Interview with the Chilean Ministry of Environment

Central Statements

- MTV should be in charge of independent technical entities, in compliance with transversally validated methodologies and transparent reporting systems and verification and operational protocols developed by technical and political institutions (energy/environment), including the private sector, academy and civil society.

- A certification system is relevant both for the national as well as the international market, given the 2050 carbon neutrality pathway and the eventual Long Term Climate Strategy (LTCS) to be implemented by the country.

- A H2 certification scheme in Chile could leverage investment initiatives.

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Ministerio del Medio Ambiente

Gobierno de Chile

NATIONAL

Interview with the ProChile

Central Statements

- Certification allows to create a country image and to deliver confidence to products from Chile. It is a commitment that the country is making, an effort to ensure sustainable development under high standards. This can be an entry visa to certain export countries.

- Periodic updates must be contemplated in the methodology architecture, to consider technological development.

- At the beginning, certification should be voluntary; this allows to test the system and to improve it, adapting critical points. Also forcing all companies to become certified can lead to two critical factors: the need to allocate a large part of the companies` resources to this certification, making difficult to develop other areas; or: it will allocate as little as possible to achieve a very basic certification. This is a risk. Certification could become mandatory once a certain critical mass is certified.

- It is a matter of avoiding too high certification prices that only large companies can pay.

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ProChile
MINISTERIO DE RELACIONES EXTERIORES

NATIONAL

Interview with the Hydrogen Council

Central Statements

- When hydrogen demanding countries start to import H2, it will be a pre-requisite for them to be able to demonstrate that what is coming in (importing) brings the same benefits that what they produce, it is an enabler. I don`t think there is an international market without a robust, compatible certification scheme.

- Everybody refers to scope 1,2,3 because everyone is used to corporate reporting defined by the GHG protocol; but this is not right. The right approach is the carbon footprint of products. At some point, people may start thinking to include capex emissions into emission counting/carbon footprint calculation.

- Regarding the methodology, I would consider the "Principles and Rules of Operation of the European Energy Certificate System" (EECS Rules), the European Guarantees of origin, and try to harmonize this, adopting something as close as possible to this scheme. It works and it is what all European countries have already adopted for electricity and will also adopt for hydrogen. I think EECS is the most advanced certification system worldwide.

- In terms of international harmonization of schemes: The European standard CEN about guarantee of origin is updated in line with those EECS rules. CEN standard should probably be used by ISO to make it an international standard, so it would be wise to look in detail in this EECS standard, because maybe ISO defines most of its (international) principles based on these rules.

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Hydrogen Council

INTERNATIONAL

Interview with the Porsche A.G

Central Statements

- Porsche sees the greatest potential in e-fuels, and the company is only interested in green = zero carbon hydrogen, no other types of H2. Porsche's vision in the powertrain sector is a triad: Purely electrically powered vehicles; Plug-in hybrids; Combustion engines that will be powered by e-fuels in the future.
- Porsche's overarching strategy, which will be published soon, will also consider scope 3 of emissions, and look at the entire product lifecycle.
- In context of the HIF Project in Chile, Porsche is endeavoring to conduct research in the area of life cycle assessment together with its project partners. It should be implemented as soon as possible, but no system exists yet that would allow any certificates.
- Porsche has only guaranteed complete acceptance of the fuel for the first project phase. For further project phases, the off taker of the product has not yet been defined. Regarding the fuels` transport, the aim in this stage is to minimize its emissions; but there is no concrete consideration of this to date, as the medium has not yet been determined.
- Certificates should not be limited to H2 only, but also include H2 derivatives (e-methanol and e-fuels).

INTERNATIONAL

Interview with the German Energy Agency

Central Statements

- DENA`s biogas register for verification for biomethane and hydrogen includes 180 biomethane plants and 3 Power-to-Gas plants; aim to further expand the register by focusing more on verification of H2 plants.
- DENA recently published a "Verification guide for Green H2" as part of EU registration project; report proposes verification methods for criteria of: renewability, additionality, temporal and geographical correlation; these are the sustainability criteria mentioned in European RE Directive RED.
- A certification system needs to offer net benefits to producers, so the process needs to be as burden-free for producers as possible.
- If we think of Europe as a potentially large importing market, then standards defined in RED directive will have to be met by potential countries exporting H2 or power fuels into EU as well. Recommendation: consider European standards and criteria.
- International cooperation is key, especially between exporting and importing countries.
- It always needs to be ensured that national climate targets need to be ambitious and need to be met at the same time, while exporting products like renewable hydrogen; avoid any competition between national climate target fulfilment and exportation.

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dena German Energy Agency

INTERNATIONAL

Interview with the California Hydrogen Business Council

Central Statements

- CHBC endorses the goal of the Hydrogen Council of decarbonizing hydrogen for the transportation sector: providing a 100% of decarbonized hydrogen for transport sector by 2030. And there is a specific legislation proposed for a path of an increasing mandate for more "green" hydrogen over time up to 100% up to 2045 in California.

- If the discussion is not just about H2 certification but about renewable hydrogen production, any public incentive program makes the market deployment/pull for creating projects a lot easier, and it reduces the costs both of renewable hydrogen production and the certification costs. Reducing the production costs is more important in this stage. In California, renewable hydrogen is already mandated (as mentioned about), there is a program that gives a producer money for producing renewable hydrogen.

- Hydrogen needs to compete with other fuels. At larger scale of hydrogen production, certification may make sense, but doing this at very beginning, implies too many administrative burdens, bureaucracy, and money. This would be a barrier for the development of projects.

INTERNATIONAL

MAIN CONCLUSIONS
WORKSHOPS

- Most of the participating companies have already thought about the necessity of a H2 certification scheme in Chile. The main reasons given for its implementations are:
  - Clear definition of market requirements to develop their projects
  - Improved business models, giving access to a premium market
  - Accelerate the bankability of projects
- The main criteria given by the participants for a certification scheme were:
  - Clear rules from the beginning
  - Easy to verify by third parties
  - Compliance with both national and international standards but prioritizing the last one.
- The governance should be a mixed system with public and private stakeholders with participation of external auditors.
- There exists no clear agreement on the scope that should be considered. All the participants consider Scope 1 and 2 mandatory. Some of them considered also the inclusion of Scope 3.
- During the exercise of the last workshop most of the participants agreed on an outside-in approach where possible clients and their specific requirements are identified ex-ante, following the principle that the client defines the demand. Other options such as going with the most restrictive requirements (like for example, the European RFNBO standard) to satisfy all the market segments or going with a national-based approach, were dismissed.

MAIN CONCLUSIONS
INTERVIEWS

- There exist different levels of knowledge about certification schemes and especially about the aspect of MRV, among the interviewed actors; Thus, discussion instances of the relevant aspects for a hydrogen certification scheme, including all relevant stakeholders, are very important. The knowledge and understanding of the matter of interest needs to be assured and levelled between all actors so that their opinions, concerns, and concrete suggestions can be considered in the systems´ design.

- All interviewees emphasized the importance of early-stage international cooperation when thinking about exporting hydrogen or its derivates.

- A very important aspect, which was mentioned by DENA, shall be highlighted again in this conclusion: Many stakeholders stress that it is important to avoid any competition of domestic decarbonization with export of renewable energy carriers. It needs to be ensured that national climate targets are aligned with international commitments and targets and are met at the same time as products like renewable hydrogen are exported. A national certification system, which obliges its own producers to meet the same standards and to comply with certain targets and quota as well, also contributes to its credibility.

- Nearly all interviewees would opt for a voluntary certification scheme, considering the early stage of market development and to avoid additional project development barriers. It is also important not to exclude any companies and thus, design the system as simple as possible to reduce its costs, so that not only large companies with sufficient financial budget can use it.

- Public-Private-Partnership is seen as the most promising option when thinking of the schemes` governance design; especially due to the faster response time of the private sector in context of technological innovation. In this context, it is seen very important that the government/a national public authority sets guidelines and principles which need to be fulfilled by all actors within the scheme.

A Hydrogen Certification Scheme for Chile, ideally:

- Would help develop a H2 industry in Chile by setting clear standards and accelerating the successful implementation of projects
- Must consider the international context. The H2 and derivatives export industry is promising and without a scheme in place might be delayed destroying value
- Should consider a Public-Private approach. A trusted organization should take the lead so private companies provide a feedback loop
- Should be based on principles defined by a national authority; also, certificate verifiers and – auditors should be certified by that authority
- Should be as simple as possible, to avoid administrative burden which could stop or delay project development and to reduce costs to a minimum, to prevent any exclusion of companies due to financial capacities
- Should quantify the GHG emission of the production process (thus, the proven quality of electricity used). Also water is seen as a very important aspect, especially by off-takers focused on avoiding any local conflicts of water use and consumption
- Which is also used on a national level, while considering the national emission reduction targets and its accomplishment, is expected to provide credibility and trust in international markets.

4 Advisory Report

Key Outcomes

Recommended Set of Actions for Chile to select an appropriate scheme based on an outside-in approach

1

• Define competitive products

- Chile will need to start by understanding which specific products (hydrogen and it's derivatives) can be competitively produced and exported overseas to different geographies. Thus, quantifying the LCOH at the exit of the production facility, and adding the LCOT towards the port of entry in the country of export is required.
- Also, Chile will need to assess how competitive it's products are with regards to other exporters (i.e Australia, the Middle East, Uruguay, etc.), to arrive at a conclusion: which markets and products are the ones that can be more copetitively sold overseas from Chile.

2

• Prioritize target markets

- Based on the results of the previous analysis, the public policy of hydrogen exports and derivatives from Chile must aim at selecting and establishing trade bonds with the priority markets (those where the Chilean product is deemed to be highly competitive).
- Thus, this step might involve diplomacy with regards to commitment to future recognition of EATS between both Chile and its target export market, as well as establishment of cooperation mechanisms to develop future compliant facilities in Chile for export.

3

• Understand the regulation

- After the target markets are selected and high-level decisions are made to focus on exporting specific products to those markets, both public and private stakeholders in Chile must strive to understand the regulatory framework that governs those specific products in the export market.
- It is at this stage that compliance criteria, valid pathways, understanding on product definitions, and required auditing steps for the chain of custody need to be thoroughly socialized with potential producers in Chile, as it is the "checklist" that their projects will need to comply with.

4

• Select an appropiate EATS

- Finally, once and only once the markets have been selected, the products identified, and the regulation understood will Chile be ready to select an existing EATS scheme that will prove sufficient to cover all required certification criteria demanded by the target market.

INSIGHT 1

Scheme Design Must Follow the Target Market

There are no harmonized definitions on what a "green" or "sustainable" product, either hydrogen or a derivative is. These definitions are often set by the importing market based on priority sustainability criteria. Therefore, **we recommend that efforts to define a certification scheme for Chile should begin by understanding the applicable definitions in the target markets and the regulation** to comply with those product specifications

INSIGHT 2

Markets are Demanding Specific Products based on their Final Use, and any scheme should adjust accordingly

Based on existing regulation and interactions with stakeholders that are either planning to develop export facilities or become net importers, market forces have made it so that green molecules do not have a single criterion to adhere to (see insight 1), but rather, **they have become highly specific products with environmental attributes for compliance based on what the final use of those molecules will be**. This not only affects which kind of EATS should be developed for each specific product for export, but also, it is competitiveness (products with higher compliance criteria to clear will be more expensive to produce, but also, there will be a higher willingness to pay by the consumer, which should offset those investments).

INSIGHT 3

Due to this highly specific market, an outside-in approach to adopt a scheme is our recommended way to go

We developed five pathways that the country could pursue with regards to developing or adopting a certification scheme for hydrogen. Our recommendation, also supported by interactions with Chilean stakeholders, is that **Chile would be best advised to pursue an outside-in approach (where external market signals shape the certification scheme definition), based on starting out by the identification of the quantitative competitiveness advantage of Chilean products and prioritization of high priority markets for export**. Based on this preferred approach, four actions were identified as next steps for the Chilean government to continue working on the matter:

- Identify and quantify the competitive advantage of specific products (molecules) that can be produced in Chile and exported overseas
- Select priority market and product pairs where efforts will be placed on developing trade agreements and mutual tracking instrument recognition
- Understand the regulatory framework for priority products in the markets where exports will be pursued, and the complementary nature of this emerging routes with existing International Trade Agreements
- Select the appropriate EATS that will best support the product with regards to reaching the target markets

INSIGHT 4

Regarding attributes to monitor and measure, there is no need to reinvent the wheel, but there is an opportunity to differentiate

Interviews with international stakeholders as well as our benchmark showed that **two key criteria are must haves for an upcoming EATS for Chile: (a) the renewable character of energy input and (b) carbon footprint**. Therefore, we advise that the Chilean scheme must include such attributes to add value both on the national and international level. This falls well in line with all the existing certification schemes used in international markets. However, **this does not mean that Chile should restrict itself to only those two sustainability criteria**, as we believe that adding additional criteria to the Chilean label could make exported products more attractive to certain types of off-takers and markets, and therefore, increase the willingness to pay. Also, it is likely that in the future regulation in certain markets (like the EU) could become more demanding with regards to penalizing carbon leakage or shifting of negative externalities to external countries, which could position Chilean products better. **We recommend analyzing three additional criteria that could be added to the Chilean scheme, but the mechanisms in which such criteria will be measured, validated, and audited needs to be defined at a later stage**. These criteria are **additionality of the input energy, no conflict uses of water and no conflict uses of land.**

INSIGHT 5

Adopting CertifHy seems to be the best path forward for Chile, based on national stakeholder goals and future developments in the field of certification in other markets

Based on an extensive review of the state-of-the-art of regulations in several key markets in Europe, Asia, and North America for importing green molecules, we have concluded that **it would be a good recommendation for Chile to study the existing and upcoming EU regulation with regards to EATS, as developing products and installations that are compliant with European regulation is likely to be the safest way to ensure future compatibility with most, if not all, international markets**. We advise that the Chilean scheme should be designed and implemented by considering European standards first: Guarantees of Origin (CEN / EECS) and RFNBO. This impression has been validated with key international stakeholders that are at the forefront of the development of a harmonized certification scheme worldwide, such as the Hydrogen Council Following on this logic, CertifHy has positioned itself as the world's most advanced GO scheme for hydrogen, and it is serving as a potential blueprint for this unified global scheme. Therefore, **Chile would be well advised to pursue the adoption of CertifHy, which would require the mutual recognition of GO's between the EC and the Government of Chile**.

INSIGHT 6

If the Recommendation to adopt a scheme rather than develop a new one is pursued, an eventual governance structure will be less demanding on the government of Chile

An analysis based on the governance structure of a robust existing certification scheme allowed us to identify that several roles and responsibilities need to be assigned or extended to both public and private entities, so that the scheme will be credible, self-regulating, and sustainable. In a scenario where an operational scheme with international recognition is adopted, Chile would only need to appoint: a national competent authority, an issuing body or bodies, accredit certification bodies, and work with account holders with regards to understanding the process of instrument issuing and cancellation within the existing registry.

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