

Plenary Session 4 - National H2 Institutions: tailoring the transition of their national energy systems

Development of a green hydrogen industry a mission-oriented policy Experience from Chile



Ana María Ruz
Bilbao, March 8th, 2024



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1. Corfo, Economical Development Agency
2. National Green Hydrogen Strategy and Action plan 2023 -2030
3. Green Hydrogen Committee Corfo
 - 50 MMUSD subsidy 2021 under reimbursement scheme
4. Projects in Chile main challenges - natural ecosystems, water, energy supply costs, financing
5. Corfo's tools available to support development of the Green Hydrogen industry





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1. Corfo

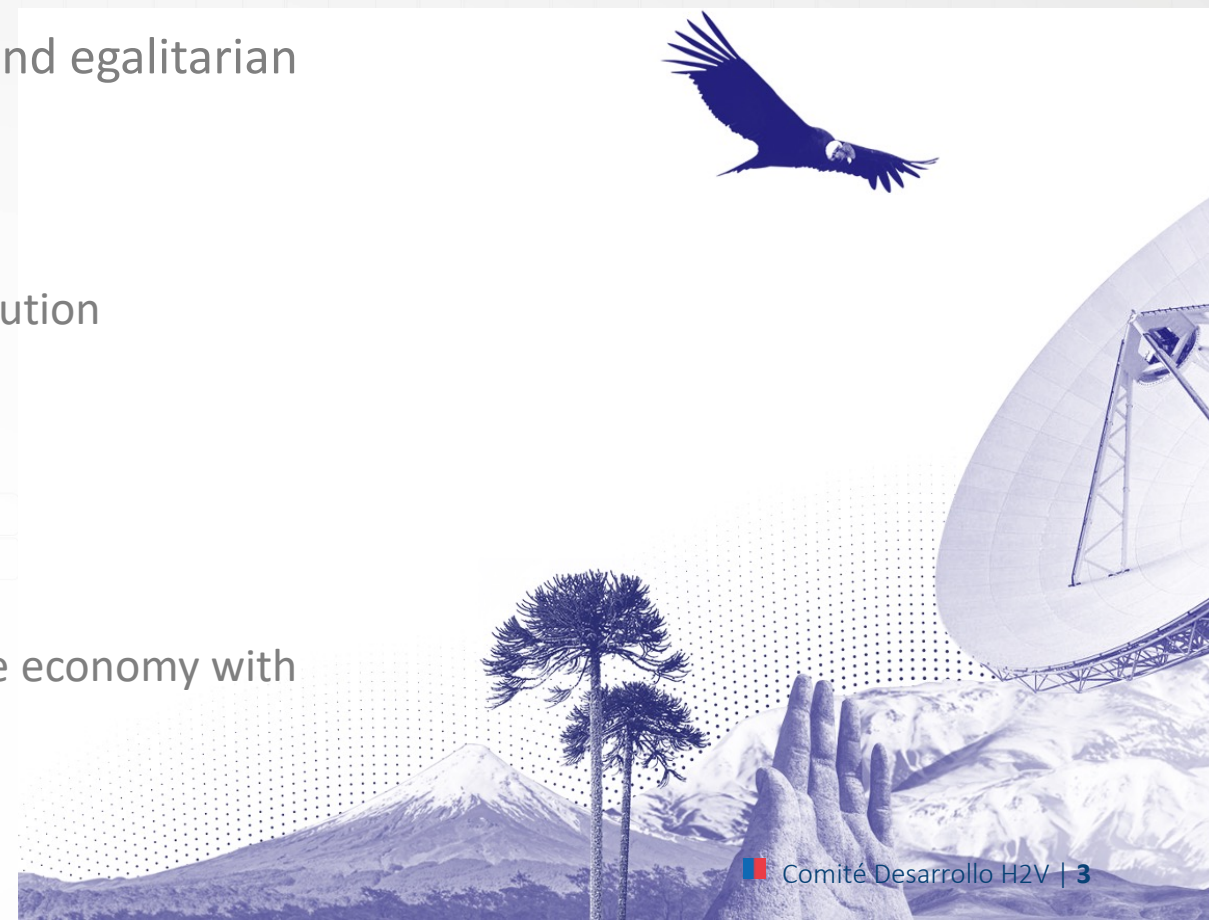
Vision: Achieve a sustainable, territorially balanced and egalitarian development model

Challenges

- Triple crisis: Climate change, lost of biodiversity and pollution
- Innovation and R&D with low levels of investment
- Non-diversified and low sophisticated productive matrix
- Social inequality

How do we move on...

- Mission-oriented toward an environmentally sustainable economy with quality jobs through knowledge





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1. Corfo

Managing pillars 2022 - 2026



1

Financing for development



2

Entrepreneurship, innovation and development



3

New industrial policies

CROSS CUTTING AXES: SUSTAINABILITY, GENDER EQUAL BALANCE AND TERRITORY DEVELOPMENT



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2. National Green Hydrogen Strategy and Action plan 2023 -2030





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2. National Green Hydrogen Strategy and Action plan 2023 -2030



The Strategic Committee for the #GreenHydrogenPlan delivered the transversal political agreements that will be key to the advancement of this new industry. Dec 2023



Roadmap for the National Strategy, reconciling economic development with respect for the environment, territory and communities

Available at: www.planhidrogenoverde.cl in public reviewing process

Planned to be published april 2024



3. Green Hydrogen Committee Corfo

Created in May 2022, to accelerate the development of the green hydrogen industry

Chaired by the Minister of Energy, Mr. Diego Pardow, with the participation of 11 ministers and the Vice President of Corfo

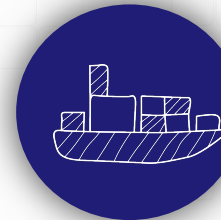
Public –public coordination



Development of local green hydrogen supply and demand for decarbonization



Reconversion of large productive and transportation segments



Export of green hydrogen and its derivatives to international markets



June 5, 2022 Santiago



Dec 21, 2022 Punta Arenas



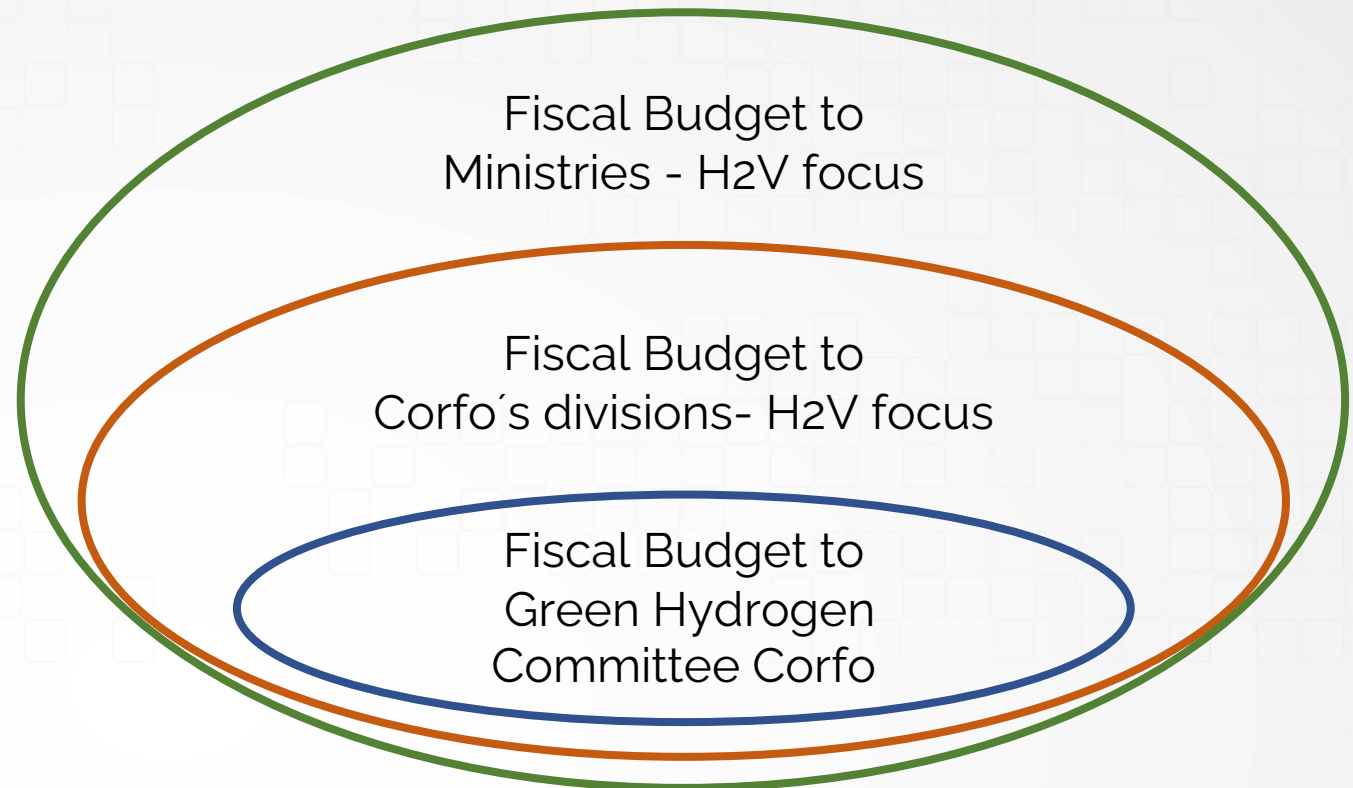
August 3, 2023 Antofagasta

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3. Green Hydrogen Committee Corfo

Budget law 2024
Ministry of Economy
Corfo
Sustainable Productive Development



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HYEX

Antofagasta

Amoniaco verde para explosivos
24 MW capacidad de electrólisis
3,200-ton H2V/a → ENAEX

Fuente: [link](#)



AMER emethanol

Antofagasta

80 MW capacidad de electrólisis
60,000-ton emethanol/a → Exportación

50 MMUSD subsidy under reimbursement scheme for projects in operation as of Dec 2025



GNL Quintero

Green Hydrogen Bahía Quintero

Valparaíso

430 ton H2V/año
10 MW H2 capacidad de electrólisis
Mezcla en redes de gas natural

Fuente: [link](#)



CAP H2V

Biobío

12 MW capacidad de electrólisis
1,550-ton H2V/año → Siderúrgica
Huachipato



Green Power

Faro del Sur

Magallanes

240 MW capacidad de electrólisis
25.000 ton H2V/a → HIF



ENGIE HYEX
 Antofagasta
 Amoníaco verde para explosivos y exportación
 24 MW capacidad de electrólisis
 3.200 ton H2V/a → **Enaex**
 Fuente: [link](#)

Air Liquide AMER
 Antofagasta
 80 MW capacidad de electrólisis
 60.000 ton emethanol/a → Exportación

Statkraft
 Antofagasta
 Amoníaco verde para exportación
 Antofagasta María Elena, Puerto de Tocopilla [link](#)

AngloAmerican
 Valparaíso
 Grúas horquillas con celdas de combustibles
 Fuente: [link](#)

En operación
HIF **SIEMENS ENERGY** **AME** **PORSCHE**

TEG
Gente Grande Magallanes
 Amoníaco verde exportación
 3,2 GW energía eólica
 1.300.000 ton NH3/a

aes
AES ANDES
 Antofagasta
 Amoníaco verde para exportación
 Fuente: [link](#)

CERRO DOMINADOR
H2V CD
 Antofagasta
 Producción de hidrógeno verde desde plantas CSP +FV
 María Elena

Gasvalpo
 Coquimbo
 Hidrógeno para mezcla en redes de Gas natural
[link](#)

Walmart Chile
 Metropolitana
 Grúas horquillas con celdas de combustibles en centro de distribución Quilicura
 Fuente: [link](#)
En operación

enel **HIF**
Faro del Sur
 Magallanes
 240 MW capacidad de electrólisis
 25.000 ton H2V/a

Haru Oni
HIF/Siemens
 Magallanes
 combustibles para exportación.
 Fuente: [link](#)

Llaquedona Green Hydrogen
 Magallanes
 Amoníaco verde exportación
 1 GW energía eólica
 85.000 ton H2v/a
 500.000 ton NH3/a

antuko
H2 Génesis
 Antofagasta
 Hidrógeno verde para plantas térmicas
 Puerto de Mejillones

enel
Cerro Pabellón
 Antofagasta
 Microred híbrida Planta Geotérmica
 Fuente: [link](#)

cve
Coquimbo
 Hidrógeno verde desde plantas FV (PMGD)
 Recortes de energía para producción de H2V

acciona

GNLQuintero
Hidrógeno Verde Bahía Quintero
 Valparaíso
 500 ton H2V/a
 10 MW capacidad de electrólisis
 H2 para mezcla en redes de gas natural
 Fuente: [link](#)

CAP
CAP H2V
 Biobío
 12 MW capacidad de electrólisis
 1.550 ton H2V/a → Siderúrgica Huachipato [link](#)

MOWI
 Aysén
 Reemplazo de diésel en la salmonicultura
 Piscicultura Fiordo Aysén [link](#)
En operación

AustriaEnergy **OKOWIND**
HNH
 Magallanes
 Amoníaco verde exportación
 1,6 GW energía eólica
 150.000 ton H2v/a
 850.000 ton NH3/a
[link](#)

TOTAL eren
H2 Magallanes
 Magallanes
 Amoníaco verde para exportación
 8 GW capacidad de electrólisis
 800.000 ton H2v/a
 Fuente: [link](#)

MAINSTREAM RENEWABLE POWER **AKER CLEAN HYDROGEN**
Faraday
 Antofagasta
 Producción de amoníaco para exportación

HDF ENERGY
Kosten Aike
 Aysén
 Hidrógeno para sustituir Diesel en sistema eléctrico

RWE
Vientos Magallánicos
 Magallanes
 Amoníaco desde energía eólica para exportación
 Villa tehuelche

FreePower
Cabeza de mar
 Magallanes
 Amoníaco desde energía eólica para exportación
 Seno Otway





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Real operating projects in Chile (scale < 1MW)



Production and injection Green Hydrogen (up to 20%) into Natural Gas distribution networks in Coquimbo and La Serena



Walmart, Santiago Quilicura Distribution Center, Replace the lead-acid batteries of 200 forklift cranes with hydrogen energy cells, cutting 250 tons of toxic waste per year



Haru Oni, the first operating eFuels facility in the world. On Feb. 2024, 2nd exportation of efuels to UK (20,000 l)





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4. Main challenges – Natural ecosystems

La transición energética no puede significar poner en alto riesgo a especies en peligro de extinción y el Hidrógeno verde no se pueda desarrollar a cualquier costo.



Hidrógeno Verde: Los avances y cuestionamientos de la nueva industria promesa de Chile | Fundación TERRAM

Ovejero Noticias | 8 de agosto de 2023
ENERGÍAS, ENERGÍAS RENOVABLES, HIDRÓGENO VERDE EN MAGALLANES, TITULARES



EL PAÍS

Sacrificios del hidrógeno verde

Los grandes proyectos anunciados para la Región de Magallanes y sus gigantescos parques eólicos están proyectados justo en áreas que son críticas para tres especies de aves en peligro de extinción



La planta de demostración Haru

Región de Magallanes: Expertos alertan que proyectos de hidrógeno verde ponen en riesgo a aves "en peligro"

Chicoes con las turbinas y pérdida de hábitat son parte de las preocupaciones. Desde la Asociación Chilena de Hidrógeno aseguran que las medidas que toman algunas empresas son más altas que las que exige la legislación nacional.



Columna de Sara Larrain: Industria del Hidrógeno: ¿con qué estándares ambientales y territoriales?

LATERCERA Sara Larrain



Scientific knowledge of natural ecosystems is absolutely necessary to create social consensus, trust and awareness of positive and negative impacts.

Just first steps: sensitivity map and base lines studies, we must move quickly

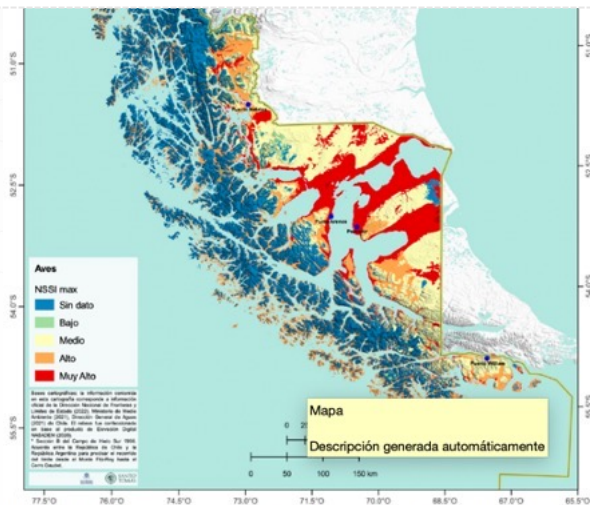


Figura 30. Distribución espacial del Índice Normalizado de Sensibilidad de Especies máximo, NSSI_max para Aves en la Región de Magallanes. Se ilustran como referencias los límites regional e internacional entregados por la DIFROL.

Source: Estudio mapa de sensibilidad para el desarrollo de parques eólicos en la industria regional de hidrógeno verde sostenible, UST 2023



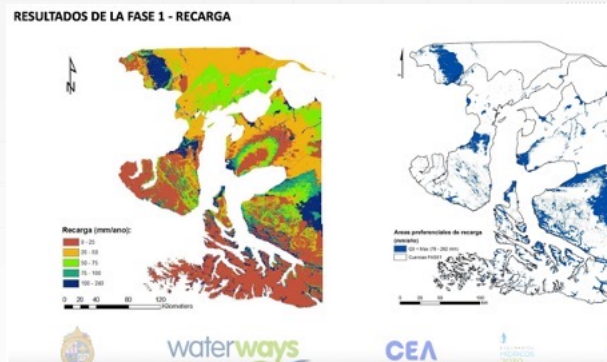
4. Main challenges - Water



Antofagasta
 13 desalination plants
 Capacity 6,388 l/s 2023
 Copper mining >80%
 Green hydrogen 2050 2,200 l/s

Magallanes
 1 desalination plants
 Capacity 63 l/s 2023
 Methanex 100%
 Green hydrogen 2050 2,488 l/s

Source: Seawater desalination map, ACADES 2023
 Development pathways for “hydrogen hubs” in Chile, LBST 2022



Building environmental baseline of the Magallanes Region

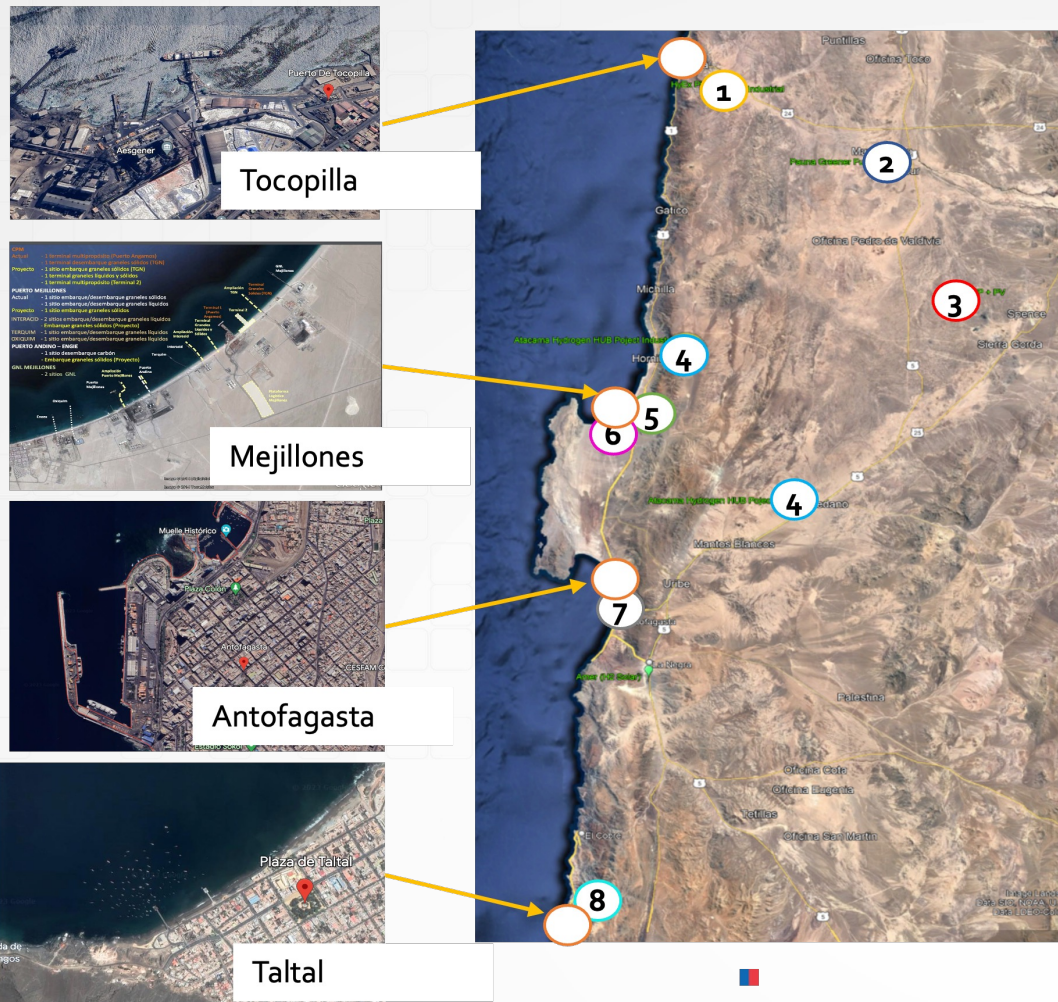
Identification of water conservation zones for the implementation of Nature-Based Solutions (NBS) in the Magallanes Region

- Water Security Index
- Marginal cost abatement curves

Source: Estudio línea base hídrica en Magallanes Fundación Chile 2023 -



4. Main challenges – Logistic infrastructure



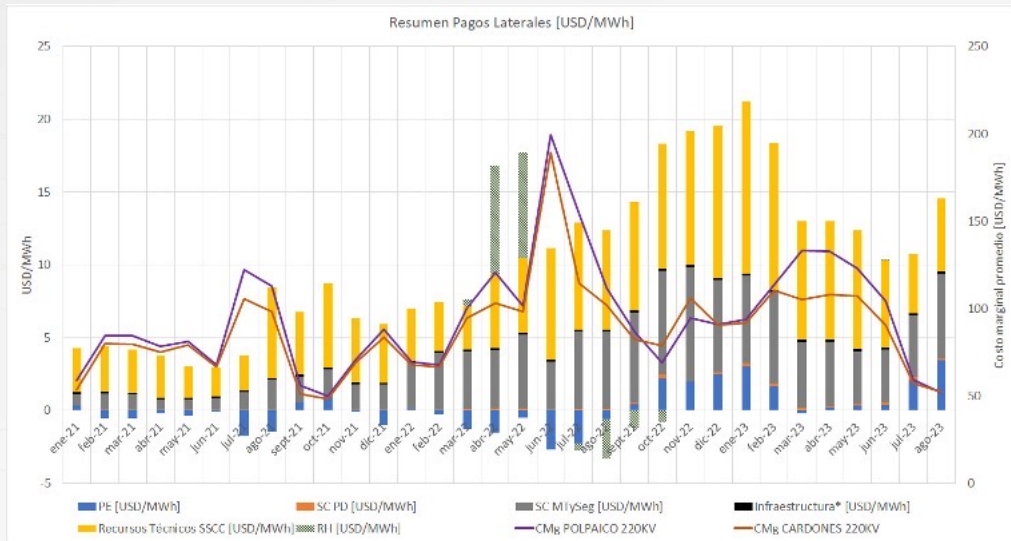
- 12 projects are evaluating/negotiating the use of the Mejillones Port Complex
- Will regulations, macrozonal logistical plans be on time?
- Tocopilla and Taltal are development poles that require a specific public policy



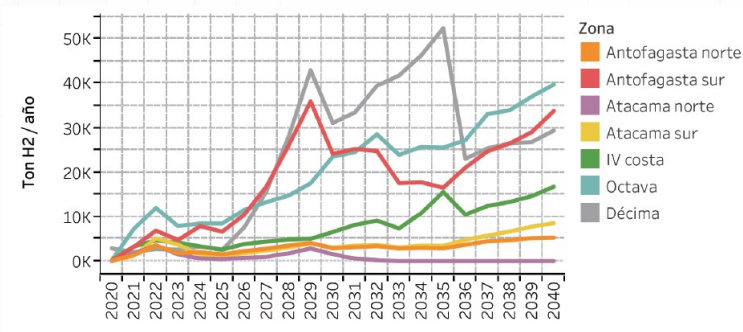
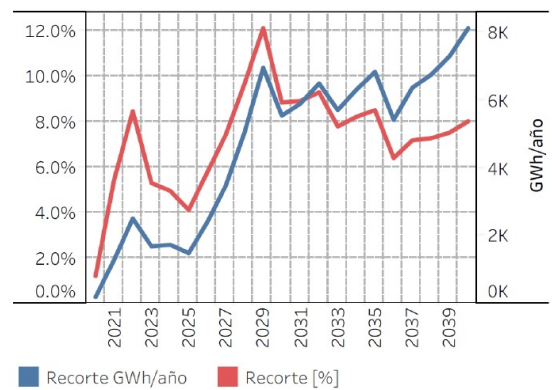
Concept Ecoparque Industrial Mejillones



4. Main challenges – Energy transition process



Source: ACENOR, 2024



Source: Identificación de nuevos modelos de negocios duales, energía e hidrógeno verde, para empresas pequeñas y medianas con plantas de ER. ISCI 2020

- Systemic costs (power, complementary services, public services, transmisión and others) have increased from 5 USD/MWh 2021 to 15 USD/MWh 2023
- Curtailment because of transmisión capacity have mean insolvency of renewable electricity companies
- 25 GW of electrolyzers (30 GW ER) decarbonization plan requires additional installation of >20 GW of RE



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4. Main challenges - Financing

Financing program (or Facility) seeks to reduce costs and mitigate financial risks for the development of the H2V industry in Chile will operate 3Q2024 with 1,000 MMUSD



BID and Banco Mundial signed protocols
Nov 11th, 2022 (COP 27)



EU Team signed agreement
June 14th, 2023 (Santiago)





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5. Corfo's tools available to support development of the Green H2 industry

01	Green Hydrogen Facility It will seek to catalyze private investment in production projects, demand and actors in the H2V value chain, through instruments that mitigate risks and reduce costs. Reference: Under development	USD 1,000 million in total Q4 2024
02	Green Credit Financing program with competitive conditions to promote the development and execution of projects that mitigate the effects of climate change Reference: In the following Corfo link	USD 20 million per project Open
03	Technological Program for hydrogen demand Seeks to increase the rate of innovation in companies of the H2V industry, through the execution of technological project portfolios and coordination of consortiums. Reference 2023: In the following Corfo link	USD 3.6 millones per project Q1 2024
04	R&D tax incentives law Up to 35% tax credit against the First Category Tax on the amount invested in R&D and the remaining 65% may be considered an expense necessary to produce the income. Reference: In the following Corfo link	Up to USD 1.2 million/año per RUT (chilean company ID) Open
05	High Technology Innovation Support R&D-intensive innovations that face high technological uncertainty and point to scale-ups with high potential for national or global commercialization. Reference: In the following Corfo link	USD 1.1 million per project Open
06	Create and Validate Development of new or improved products (goods or services) and/or processes, requiring R&D, from the prototype phase, to the technical validation phase at a productive or commercial scale. Reference 2023: In the following Corfo link	USD 220,000 per project Q2 2024
07	Human Capital Expert Strengthening of R&D&I capabilities in national companies, through the insertion of highly qualified professionals and technicians. Reference 2023: In the following Corfo link	USD 41,000 per project Q1 2024
08	Viraliza Training Support entities to carry out programs for the transfer of knowledge, skills, tools and/or culture of entrepreneurship and innovation. Reference: In the following Corfo link	USD 31,000 per project Open
09	Network Projects (Belgium, Chile, France & Spain) Seeks to support R&D&I projects led collaboratively between Chilean companies and companies from the defined countries, applied to energy, water, H2V, transportation, among others. Reference: In the following Corfo link	USD 220,000 per project Open
10	Call25 Eurogia2030 - Eureka Networ The Eurogia cluster is carrying out a call for proposals based on four thematic pillars to mitigate and adapt to climate change. Reference: In the following Corfo link	To be determined Open

THANKS / GRACIAS

Un saludo especial a las mujeres presentes y a todas en este día internacional de la mujer



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