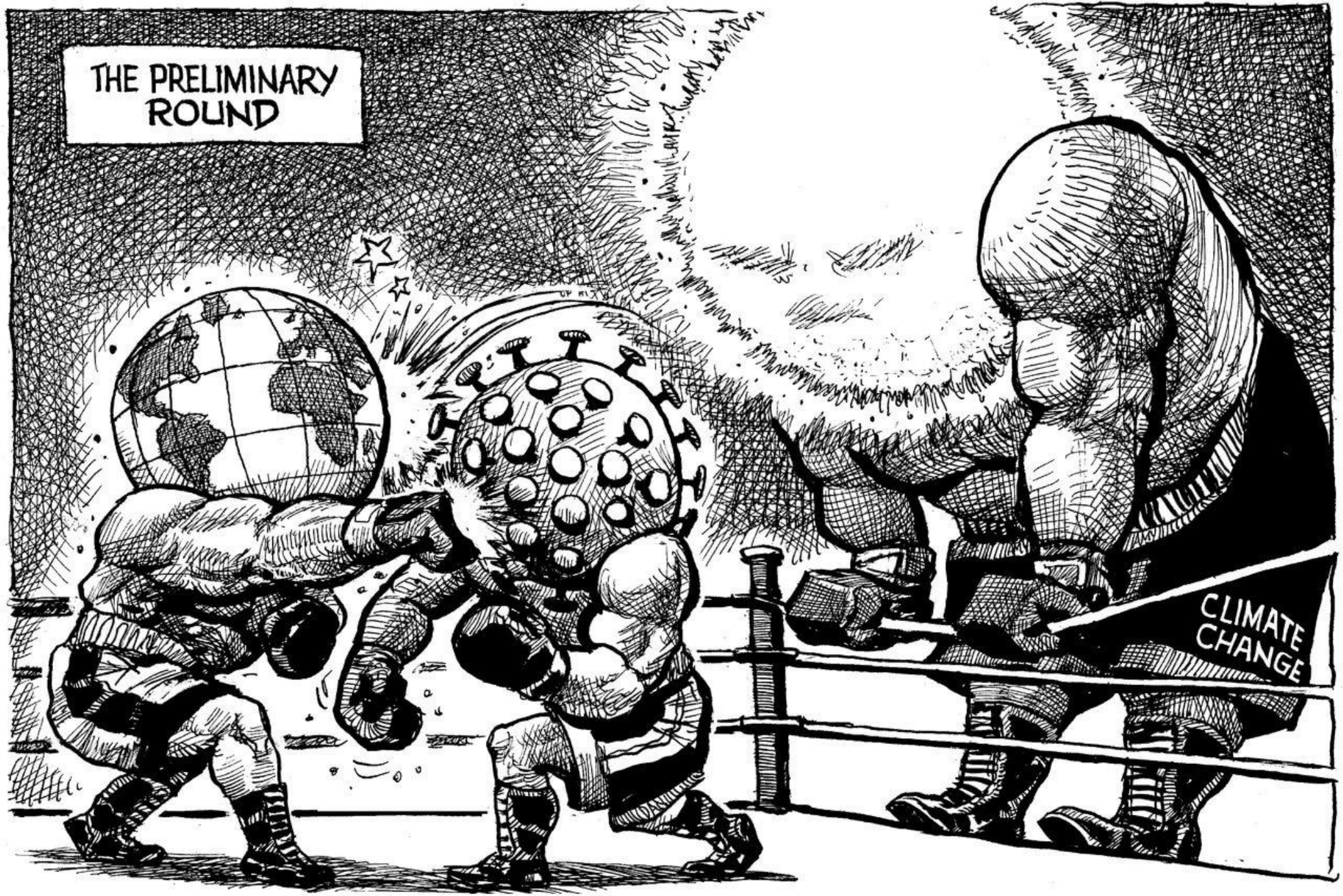
Ministerio de Energía

Gobierno de Chile

The National Green Hydrogen Strategy of Chile

Low carbon hydrogen in Chile:
Strategic challenges for France

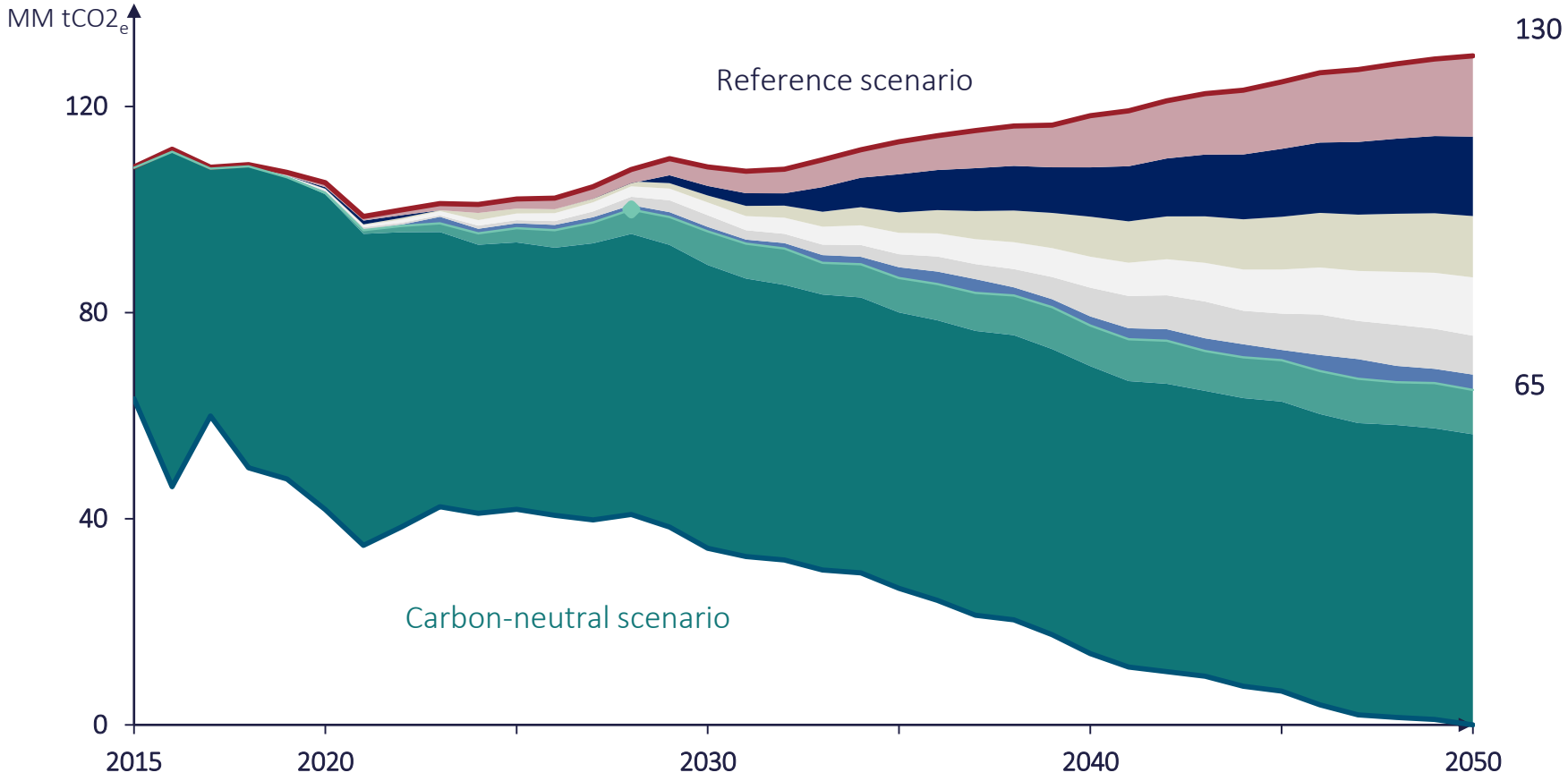
June, 2021

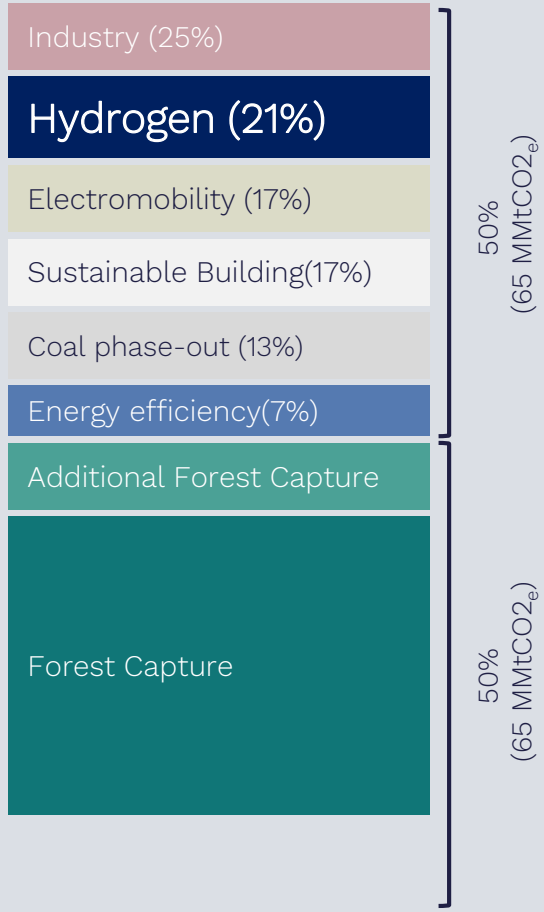


Economist.com

Kal

Green hydrogen will be key for Chile to reach net-zero emissions by 2050





Our renewable potential amounts to 70 times our current capacity

Our ambition

2025

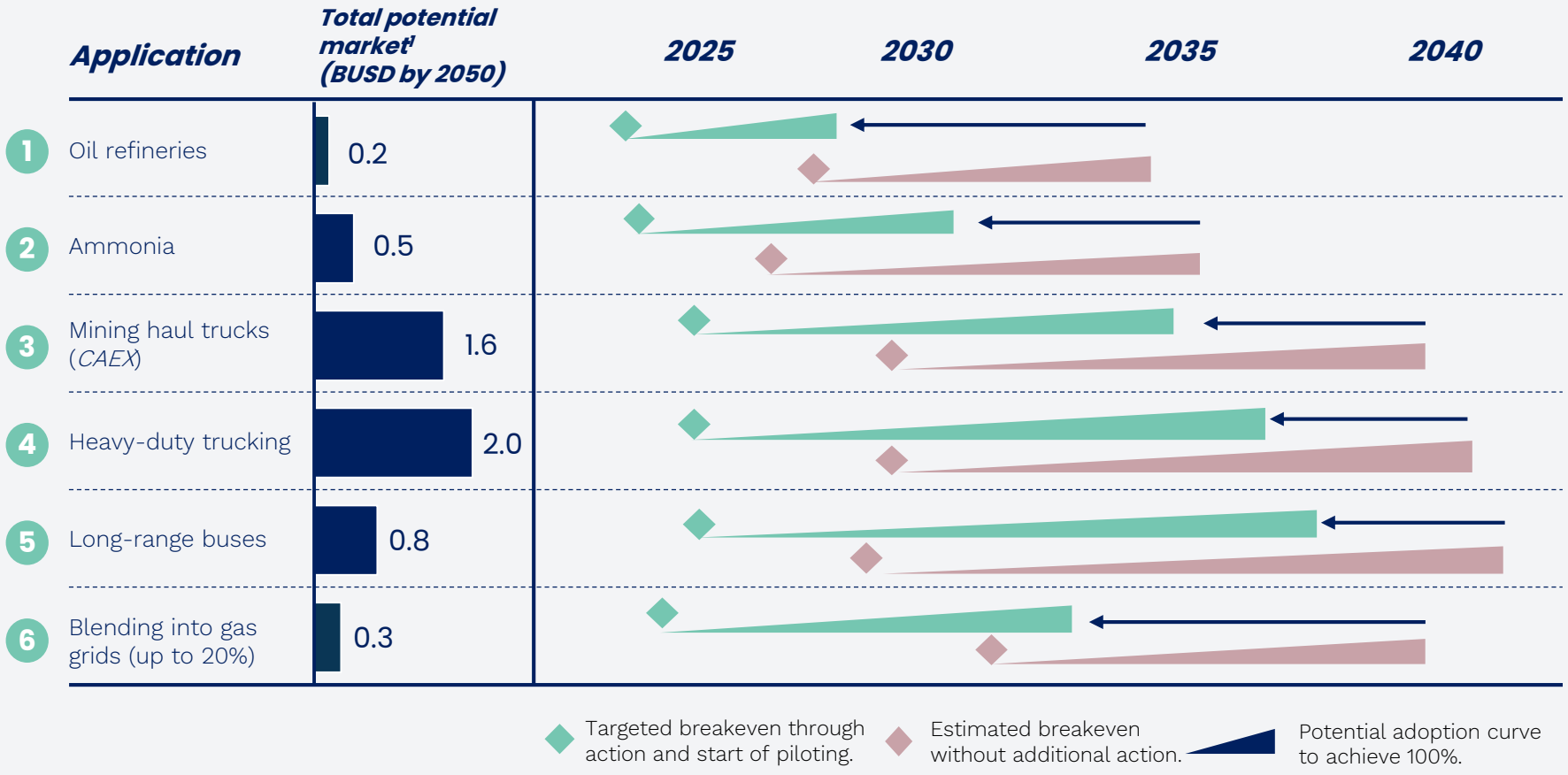
- **5 BUSD** — Top destination for green hydrogen investment in LATAM
- **5 GW** — Electrolysis capacity operating and under development
- **200 kton/year** — Production in at least 2 *hydrogen valleys* in Chile

2030

- Leaders in export of green hydrogen and derivatives — **2.5 BUSD/year**
- The cheapest green hydrogen on the planet — **<1.5 USD/kg**
- Leaders in production of green hydrogen via electrolysis — **25 GW**

Wave I: 2020–2025
Domestic ramp up and export preparation

We will accelerate the deployment of green hydrogen in 6 prioritized applications to build local supply chains and acquire experience.



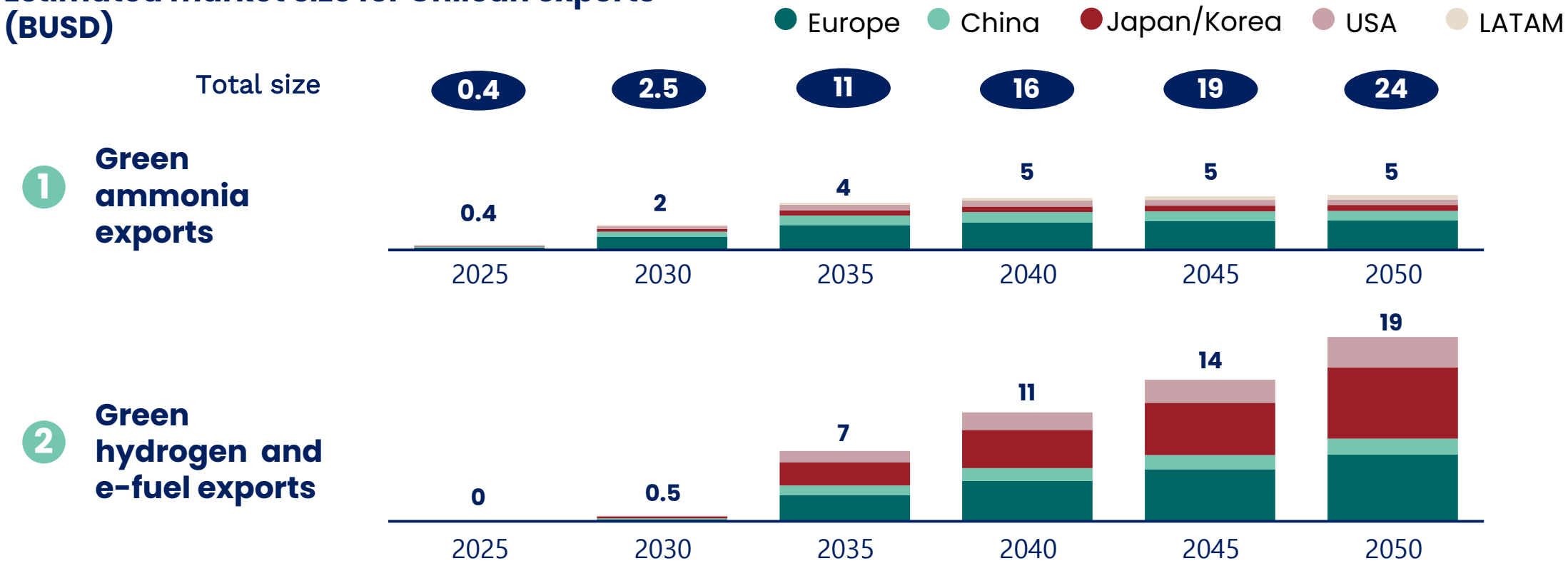
1. Annual sales. Considers the full transition to hydrogen of the energy demand in each application.

Source: Based in analyses from McKinsey & Company.

Waves II & III: 2025–2030 & 2030+

Scaling up to capture global markets

Estimated market size for Chilean exports (BUSD)



Source: McKinsey & Company.

Projects have sprung in Chile too

Engie anuncia proyecto HyEx de hidrógeno verde, esencial para tronaduras en minería

ENGIE

Next Step?
Partnership & Start the first move

AES Gener anuncia su primer proyecto de hidrógeno verde en Chile

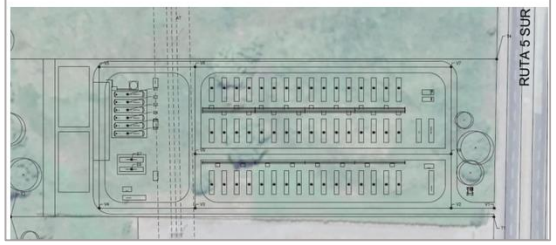
AES Gener
energía confiable

EARLY ACCESS Empresas Energía

Empresa eléctrica firmó un memorándum de entendimiento con un "importante actor" del negocio. Para llevarlo a cabo, requiere levantar hasta 850 MW de energías renovables.

SEA acoge a trámite proyecto de generación de respaldo en base a diésel-hidrógeno

Central Eléctrica La Palma busca instalarse en la Región del Maule, con una capacidad de 70 MW, usando grupos electrógenos. Su inversión contemplada es de US$30 millones.



Clean energy & food

Bus transport for personel

Blending into gas grids

Forklifts

Forestry trucks

Small vessels

District heating

Isolated grid power

BHP

BHP entra en la carrera del hidrógeno verde con proyecto piloto en minera Spence

La compañía impulsa una iniciativa para reemplazar el diésel y gas natural que utilizan en las calderas del proceso de Electro-Obtención del cobre.

ENGIE

Se confirma consorcio Hydra para el desarrollo de hidrógeno en minería

UC de la Santísima Concepción será sede de planta piloto de hidrógeno verde

AustriaEnergy

Oil companies and major utilities mulling purchase of 1.4GW green hydrogen project in Chile

The $3bn HNH facility — to be powered by at least 1.8GW of onshore wind — will generate up to one million tonnes of green ammonia per year and feature its own international port

Lanzamiento Alianza Estratégica Hidrógeno Verde para el Biobío

Fecha: 15 Abril, 2021 | **Fecha Fin:** 15 Abril, 2021
Hora: 09.00 horas | **Hora Termino:** 10.30 horas

Anuncian innovador proyecto piloto de producción de Hidrógeno Verde en Magallanes

HIF

por Agenda País | 2 octubre, 2020

ENAP

HIDROGEN PROJECT SHEET

POWER TO LIQUIDS

HARU ONI PROJECT

Haru Oni is expected to yield the world's first integrated, commercial, industrial-scale plant for making synthetic climate-neutral fuels (E-Fuels)

PRODUCTION

Wind power is used to split water obtained from well through an electrolysis process, obtaining oxygen and hydrogen. The hydrogen is combined with captured carbon dioxide to produce synthetic methanol. Finally, part of the methanol is then converted into synthetic gasoline, termed by the project developer as E-Fuel.

PROJECT OWNER AND PARTNERS

PROJECT OWNER

HIF is an SPV owned by AME

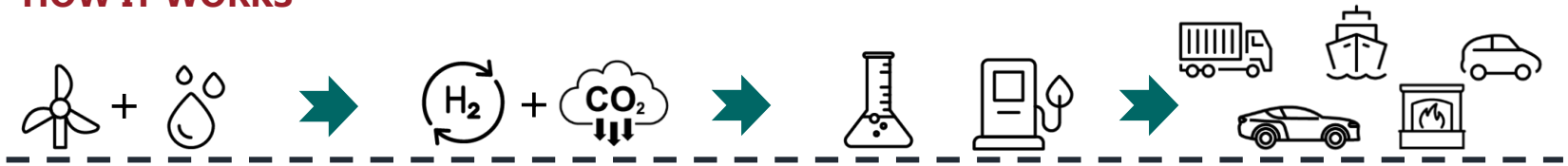
PARTNER COMPANIES

SIEMENS energy, ENAP, enel, PORSCHE

SIEMENS ENERGY	: Co-developer, partner, and technology provider.
ENEL	: Renewable power developer and supplier.
ENAP	: Chilean National Oil company. Transport, storage, and port service and infrastructure provider.
PORSCHE	: Investor and Offtaker.

Siemens received a grant of **8 million euros** for the project from the German Federal Ministry of Economics and Energy.

HOW IT WORKS



Wind power + **Well water** → **Green hydrogen** + **CO_2 captured from the air** → **E-Methanol** **E-Fuel** → **Applications**

STATUS

Pilot phase is currently under evaluation by the Environmental Evaluation Service.
Pilot operation is expected for 2022.

38 million USD
Total investment Pilot phase

PROJECTIONS

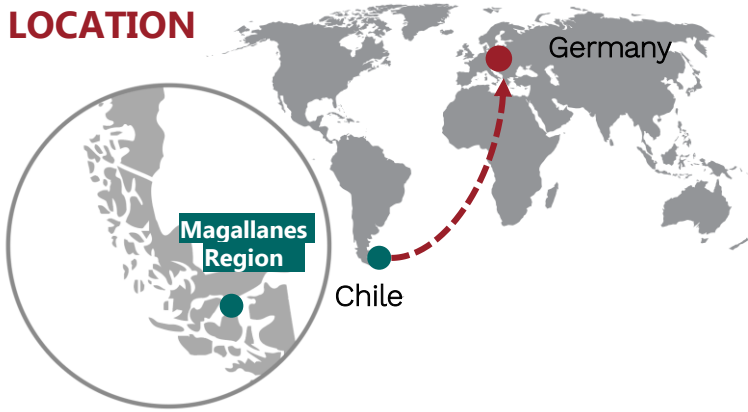
Pilot Phase	1st Phase	2nd Phase
130.000 Liters e-fuel per year	**70 million** Liters e-fuel per year	**2000 million** Liters e-fuel per year
2022	**2024**	**2026**

OFFTAKE

MABANAFT is the trading division of Marquard & Bahls and concentrates on physical oil trading. They announced an MOU to the purchase and sale of up **to 500 million liters of carbon neutral E-Fuels per year** from the project's commercial phases.

PORSCHE will start with an initial investment of 20 million euros and is planning to use the E- Fuels from Chile in Porsche's motorsport fleet, at Porsche Experience Centers and, later, in series production sports cars.

LOCATION



(*) All the content of this sheet has been obtained from the official websites of the partners involved in the project and from the Chilean Environmental Evaluation Service.

HIDROGEN PROJECT SHEET

POWER TO AMMONIA

GREEN AMMONIA PROJECTS

2 publicly known projects are under development in the North of Chile to produce green ammonia at a large scale for domestic consumption, maritime transportation use, and possibly export.

PRODUCTION

One project will use exclusively solar PV power, as well as the grid, to produce green hydrogen with desalinated water, for its later use in a Haber Bosch plant to produce ammonia.

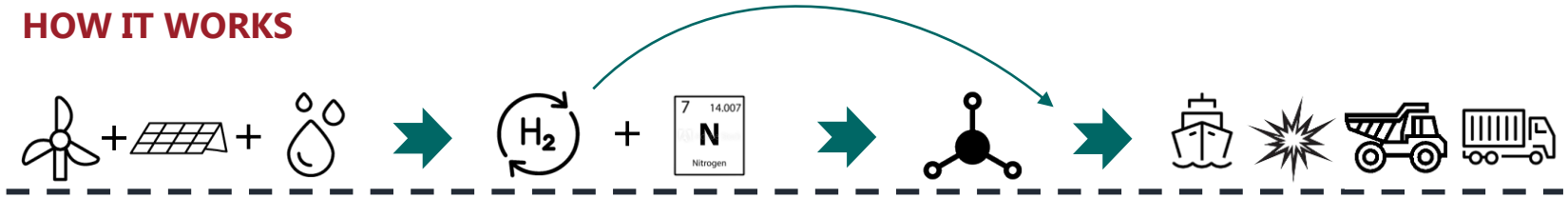
The other project has not specified the renewable power mix it will use nor its water supply.

PROJECT OWNER AND PARTNERS

	HyEx Project	AES Project
PROJECT OWNER	ENGIE	AES
PARTNER COMPANIES	Enaex	

ENGIE	: Developer, operator, investor, power supplier.
ENAEX	: Offtaker and investor.
AES	: Developer, operator, investor, power supplier.
PARTNER	: Undisclosed and role not yet specified.

HOW IT WORKS



Wind power + **Solar power** + **Desal water** → **Green hydrogen** + **Nitrogen captured from the air** → **Green ammonia** → **Applications**

STATUS

Projects are under feasibility study and have not yet entered the Environmental Evaluation Service.

Both companies have extensive renewable project portfolios and terrains.

Both companies have coal power plant infrastructure in the Mejillones and Tocopilla bays: terminals, desalination, concessions, transmission lines.

2025
Est. date for COD if investment decision is taken 2021.

SCALE OF 1st COMMERCIAL PHASE

HyEx Project	AES Project
1.000 MW Solar PV capacity	**850 MW** Renewable capacity
350.000 ton Ammonia production	**2-300.000 ton** Est. ammonia production

OFFTAKE

ENGIE has signed an MoU with **ENAEX** for the development of a green ammonia project to supply the latter's Prillex Plant, the largest explosives production facility in Chile. It serves the mining industry. **ENGIE** has also mentioned an interest in future expansions for export and use in shipping.

AES will develop its project with an undisclosed global partner to supply green hydrogen to the mining sector for transport applications, as well as green ammonia for maritime transportation.

LOCATION

(*) All the content of this sheet has been obtained from the official websites and public presentations of the partners involved in the project, as well as from press reports.

We have prioritized 4 lines of action to execute this National Green Hydrogen Strategy

1. Regulation and permits

2. Finance and incentives

3. Domestic market and international partnerships

4. Local value

1 Regulation and permits

Transparent, harmonized standards will enable early projects

Objectives

- **Reduce uncertainty** in the market to accelerate and facilitate the execution of green hydrogen projects
- **Reduce the complexity** associated with new project development

3 key initiatives in progress

- **Define economic and taxation instruments** to accelerate an energy transition, aiming to carbon neutrality
- **Develop a green hydrogen by-law for key applications**, to enable quick and effective development of projects
- Define a **Green Hydrogen Legislation** to promote demand

Next steps

- Evaluate other relevant **existing gaps in regulation and permits inhibiting quick and effective project execution**, assessing existing best practices

2 Finance and incentives

The focus on supply-side support will spill over to diverse applications

Objectives

- **Close cost gaps ,** fostering scalability locally
- **Develop incentives** to promote development of early stage projects

3 key initiatives in progress

- **Attract bilateral financing and development banking**, with major focus on grants and concessional debt that will enable boosting of green hydrogen projects
- **Launch a 50 MUSD funding round** to support developers of scalable green hydrogen projects
- **Establish** ***certification of origin*** in order to validate internationally quality of Chilean hydrogen exports

Next steps

- Establish **additional initiatives to reduce financing cost for green hydrogen projects**

3 Domestic market and international partnerships

Unlocking mining sector and overseas demand

Objectives

- **Accelerate internal demand** to achieve decarbonization and start the development of a green hydrogen market
- **Capture external demand** fast to position Chile as a competitive supplier

3 key initiatives in progress

- **Generate a public-private agreement** for hydrogen usage in the mining industry, defining concrete green hydrogen applications
- **Develop a transition plan with ENAP** to enable green hydrogen utilization in refineries, leveraging existing capacity and infrastructure
- **Sign offtake agreements with key markets**: European Union, Asia and North America

Next steps

- Define additional support mechanisms to foster exports and **aim to become a top 3 exporter of green hydrogen by 2040**
- **Attract Consortiums bringing international demand,** that will foster vertical integration across green hydrogen production in Chile

4 Local value

Developing infrastructure and capabilities will accelerate the fuel transition in various sectors

Objectives

- **Prepare local territories with productive potential in order to enhance value capture**, focusing on capturing value throughout the entire value chain of green hydrogen production

3 key initiatives in progress

- **Define infrastructure needs to establish key green hydrogen *hubs*** (e.g. export terminals, desalination plants, electric transmission sites)
- Define gaps **for large-scale development of manufacturing capacity**
- **Foster green hydrogen applications** in remote geographies and isolated areas

Next steps

- **Define value capture initiatives** for local suppliers alongside the productive value chain

Green hydrogen has a key international dimension

1) Co-lead clean hydrogen mission in Mission Innovation 2.0

2) Participate in the H2 Clean Energy Ministerial initiative

3) Collaborate in the International Partnership for Hydrogen in the Economy

4) Sign and implement bilateral agreements to facilitate export and industry growth

5) Continue positioning Chile in the clean hydrogen sphere

Gobierno de Chile

gob.cl

Estrategia Nacional de Hidrógeno Verde