Green Hydrogen and Linkage-based Development in Chile

Green Hydrogen and Industrial Policy Development Dialogue

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Pre-conditions

Favourable natural conditions:

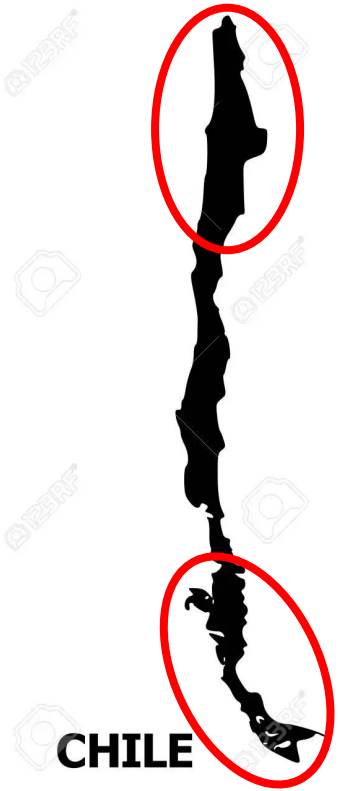
- solar irradiation in the north > 7.5 kWh per square metre a day
- wind speed in the south > 14 metres per second

Infrastructure in the north:

- large ports, railway lines and roads suitable for transport of equipment
- high-capacity power grid
- potential suppliers with a track record in mining

Climate change mitigation (Government of Chile, 2021):

- on-going decommissioning of coal-fired power stations
- 20% of fuels based on green hydrogen by 2040
- no new fossil fuels vehicles permitted from 2035/2045 onwards



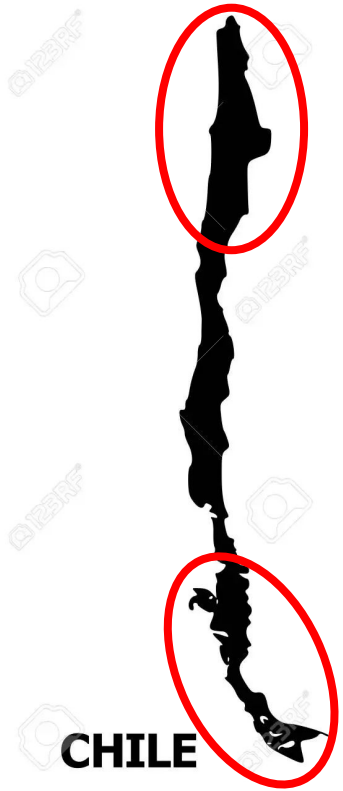
Pre-conditions

Domestic market:

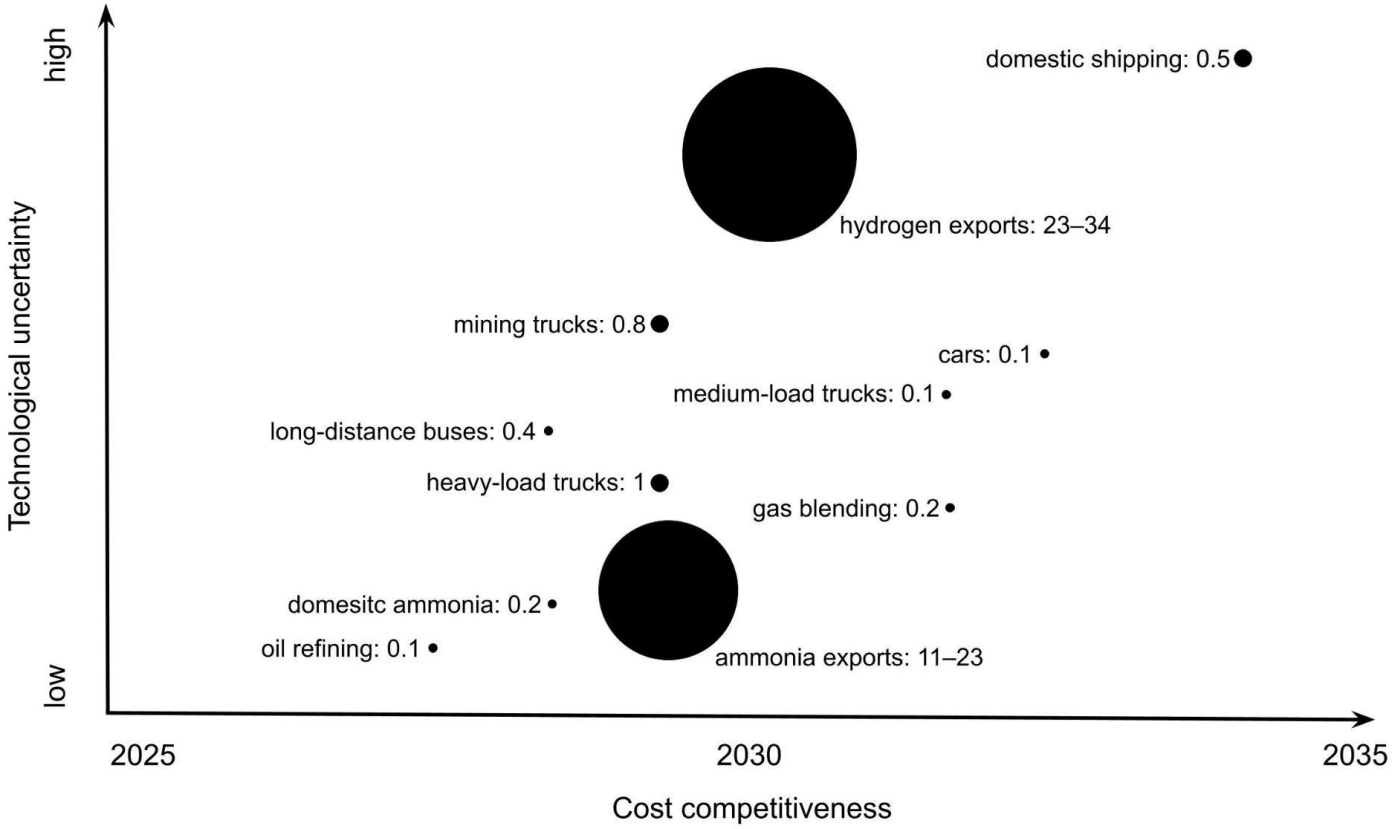
- modest demand for hydrogen: 59,000 tonnes in 2018
- mining in the north as a key off-taker (decarbonisation)
- numerous pilot projects: blending with natural gas, forklifts at a distribution centre of Walmart

Export markets:

- cooperation with the EU and Japan; agreements with the ports of Hamburg and Rotterdam
- European lead firms, especially for the e-fuels project in the south



Projected green hydrogen production



Source: Ministry of Energy (2020)

Public sector response

Key policy issues:

- credits and incentives for first movers
- streamlined regulatory framework, more rapid permit issuing, certification
- in-country value chain development: match-making for firms
- free trade zones in Antofagasta and Magallanes

Further issues:

- expansion of ports and power grids
- R&D on local context (e.g. earthquake and wind resistance)
- attract skilled labour and train local talent

Public sector response

Still to be done…

- regulatory framework, permit issuing
- land use plans
- value chain mapping

Credit schemes (Ministry of Energy, 2023):

- support from the EU, IADB, KfW, World Bank (about USD 850 million)
- Chilean share of USD 250 million
- earmarked for green hydrogen project and their enabling environment
- potentiate private investment and reach USD 12.5 billion

Private sector response

Key projects:

- Highly Innovative Fuels (HIF) in Magallanes: 500 million litres of e-fuels a year; driven by Enel, Porsche and Siemens
- Antofagasta Mining Energy Renewable (AMER): e-fuels for the mining sector; driven by Air Liquide, EDF Renewables, Copec and others
- HyEX in Antofagasta: explosives for the mining sector; driven by Engie and Enaex
- green steel by CAP in Valparaíso (in cooperation with Air Liquide)

Numerous other projects: e-fuels for maritime transport, green hydrogen train from Santiago to Valparaíso, chemicals hubs in Antofagasta

Private sector response

Backward production linkages:

- domestic production of electrolysers (problem: economies of scale abroad)
- GIZ (2020) study on participation of Chilean companies: 817 potentially important players and 2,016 firms in the wider production networks
- reluctance because of high uncertainties

Further challenges:

- capital intensity: merely 10% of future jobs in operation and maintenance (GIZ 2021)
- uncertainty about job creation in related industries (ammonia and methanol production, mining) and generic services
- long-distance commuting

Conclusion

- significant opportunities to produce green hydrogen
  - favourable natural conditions
  - infrastructure and consumption by the mining sector in north Chile
- focus on exports and clear interest by corporations from abroad
- policy frameworks and credit schemes in place… but issues with regulatory frameworks, land use plans and permit processes

- no commitment by off-takers; only pilot projects
- late-comer industrialisation questionable
  - uncertainty about backward production linkages
  - capital intensity of the industry and commuting

References

German Agency for International Cooperation. 2020. Cuantificación del encadenamiento industrial y laboral para el desarrollo del hidrógeno en Chile. https://4echile.cl/wp-content/uploads/2021/09/Encadenamiento-Reporte-Final.pdf

German Agency for International Cooperation. 2021. Cuantificación del encadenamiento laboral para el desarrollo del hidrógeno en Chile bajo un escenario de exportación. https://4echile.cl/wp-content/uploads/2021/09/Estudio-empleos-H2-verde-con-exportacion.pdf

Government of Chile. 2021. Estratégica climática de largo plazo de Chile: camino a la carbono neutralidad y resiliencia a más tardar al 2050. https://cambioclimatico.mma.gob.cl/wp-content/uploads/2021/11/ECLP-LIVIANO.pdf

McKinsey. 2020. Chilean hydrogen pathway: final report. https://energia.gob.cl/sites/default/files/estudio_base_para_la_elaboracion_de_la_estrategia_nacional_para_el_desarrollo_de_hidrogeno_verde_en_chile.pdf

Ministry of Energy [of Chile]. 2020. Estrategia nacional de hidrógeno verde: Chile, fuente energética para un planeta cero emisiones. https://energia.gob.cl/sites/default/files/estrategia_nacional_de_hidrogeno_verde_-_chile.pdf

Ministry of Energy [of Chile]. 2023. Gobierno presenta fondo por US$ 1.000 millones para el desarrollo del hidrógeno verde en Chile. https://energia.gob.cl/noticias/nacional/gobierno-presenta-fondo-por-us-1000-millones-para-el-desarrollo-del-hidrogeno-verde-en-chile