

Perspective on Hydrogen

Lanzamiento de mesas técnicas

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In brief

Our perspective
on the potential of
hydrogen and why
Chile could have
an edge

1 Hydrogen is required for deep decarbonization

Direct electrification can serve max. 60% of today's energy demand in many parts of the world, though Chile could achieve its target of net 0 in 2050 with limited use of hydrogen

2 Unprecedented global momentum

Driven by 4 underlying trends – decarbonization, falling renewable costs, strategic government push, and industry coordination

3 The global potential is large: 10x of today's hydrogen market

Growth in feedstock, transport, buildings, industrial heat, and electricity

4 Costs are coming down fast, but are still challenging

In industry feedstock and some transport applications, low-carbon hydrogen could become cost competitive before 2030.

For steel, high-grade heat production and some residential heating, hydrogen is the lowest-cost decarbonization option – but needs regulatory support to compete with fossil fuel alternatives.

5 Chile has great potential to profit from hydrogen development

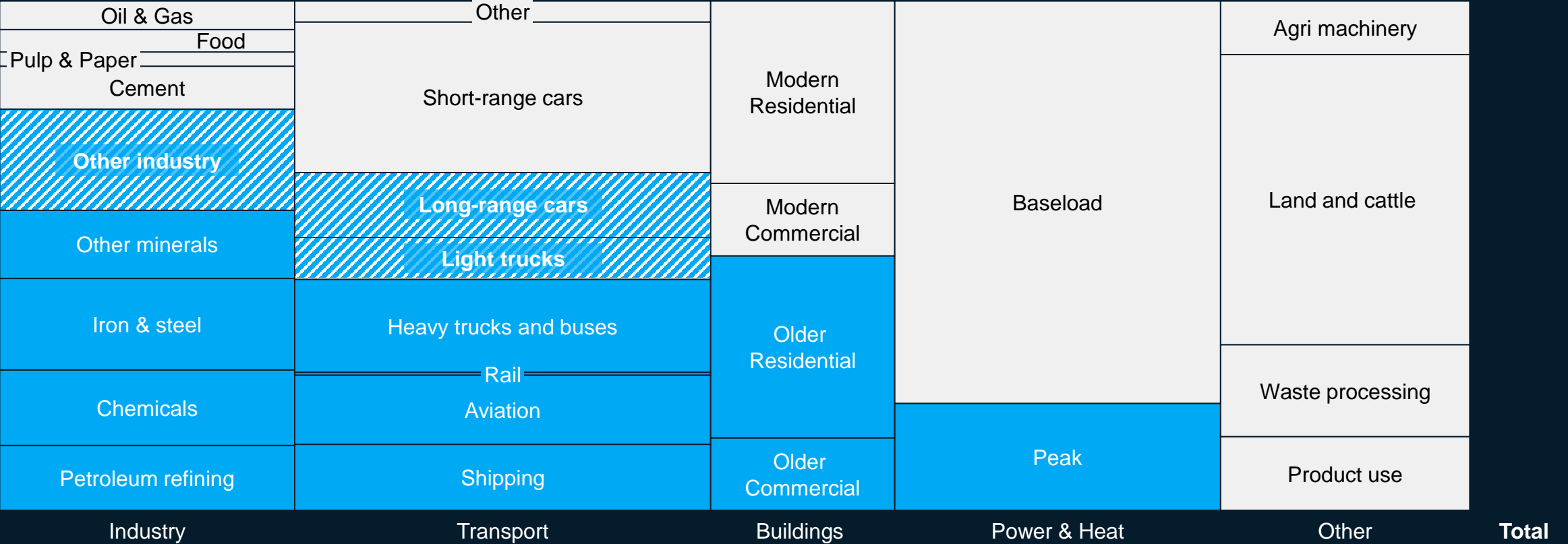
Leveraging the ultra low-cost renewables, stable environment for long-term investments, good exporting options, and some internal demand e.g. in mining, Chile could tap into hydrogen

1. Hydrogen is a solution in "hard to abate" sectors and could abate ~15% of global emissions by 2050

■ Sectors where hydrogen can contribute

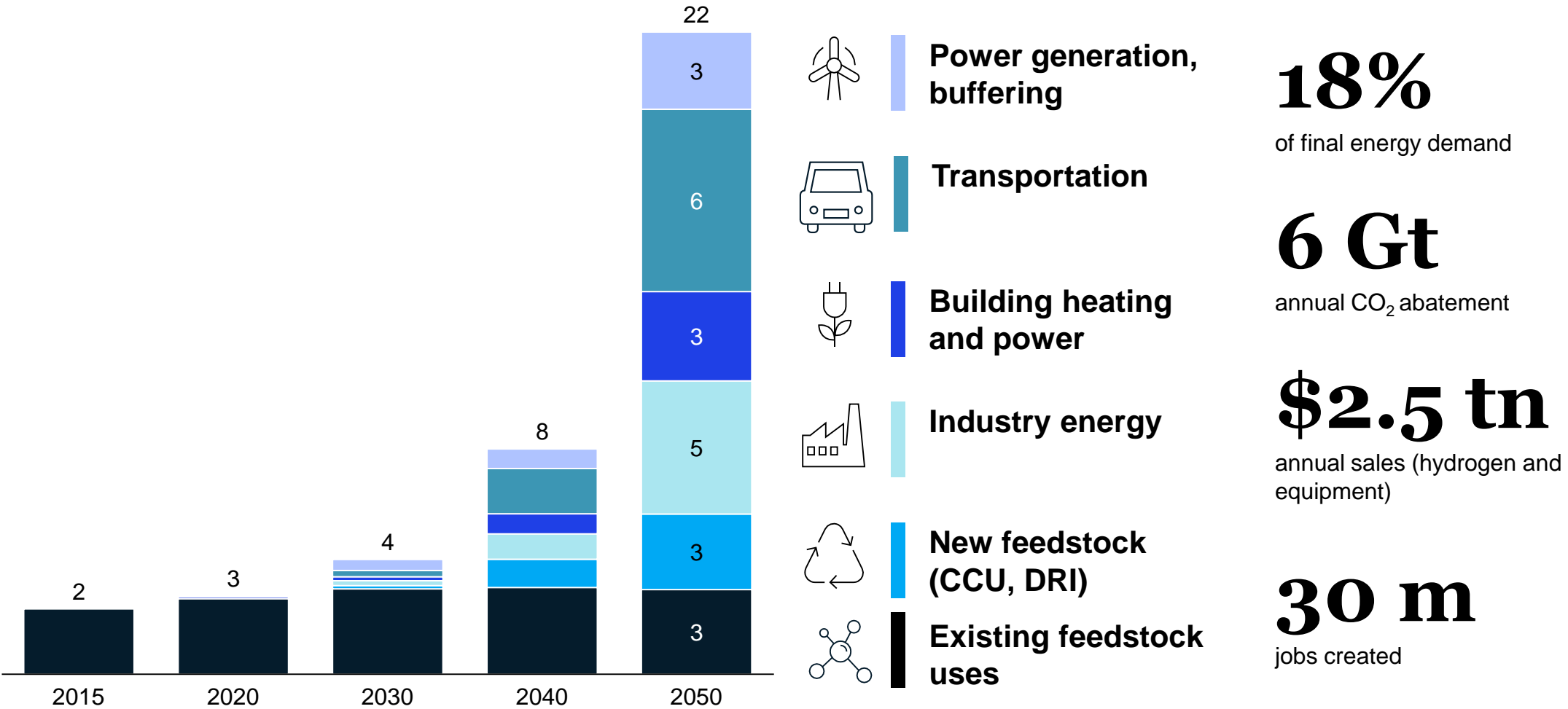
Greenhouse gas emissions by sector

MtCO₂e



3. In a decarbonized world, Hydrogen demand could grow up to 10-fold

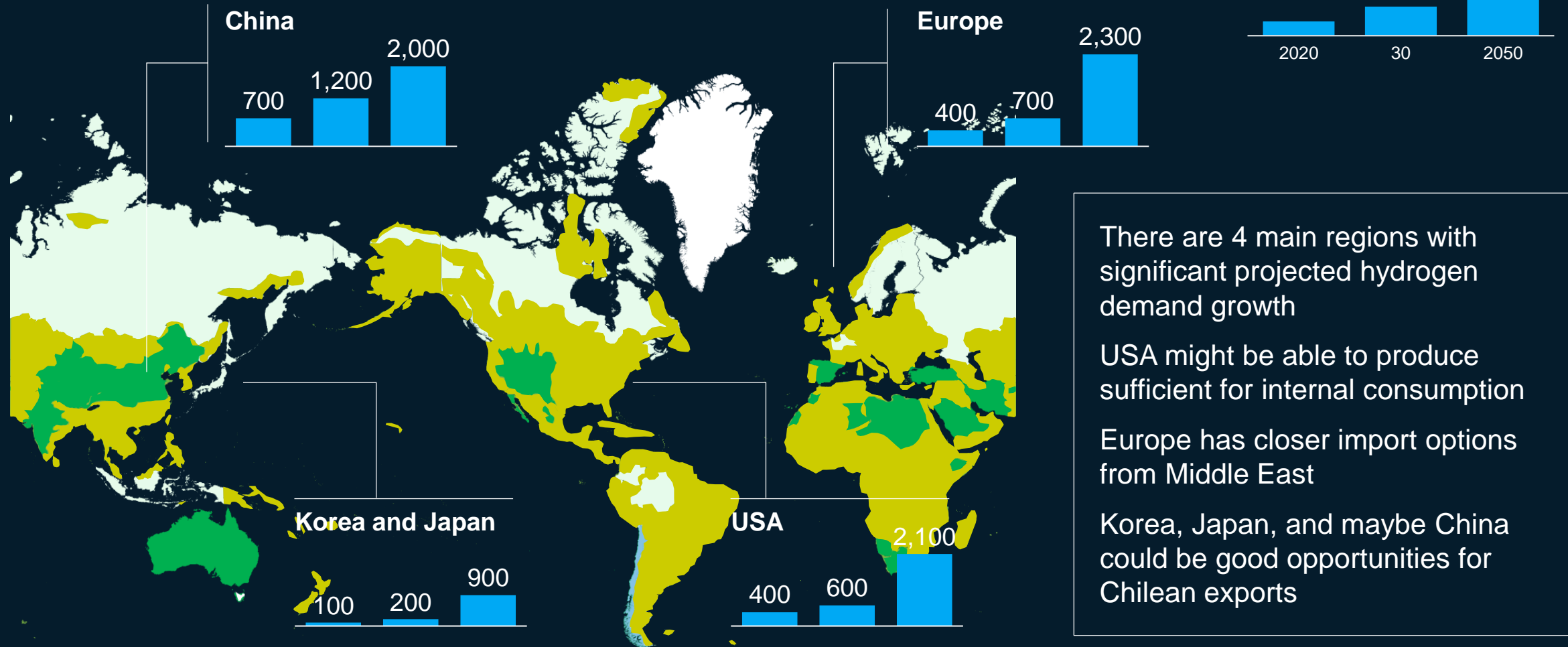
Global energy demand supplied with hydrogen, PWh



5. Europe, Korea, Japan and likely also China will require hydrogen imports – creating a sizable global market opportunity for competitive hydrogen producers

Cost of green hydrogen in different regions, in USD/kg in 2030: ■ USD < 1.5/kg ■ USD 1.5-2/kg ■ USD 2-3/kg ■ USD > 3/kg

Regional energy demand supplied with hydrogen¹, in TWh

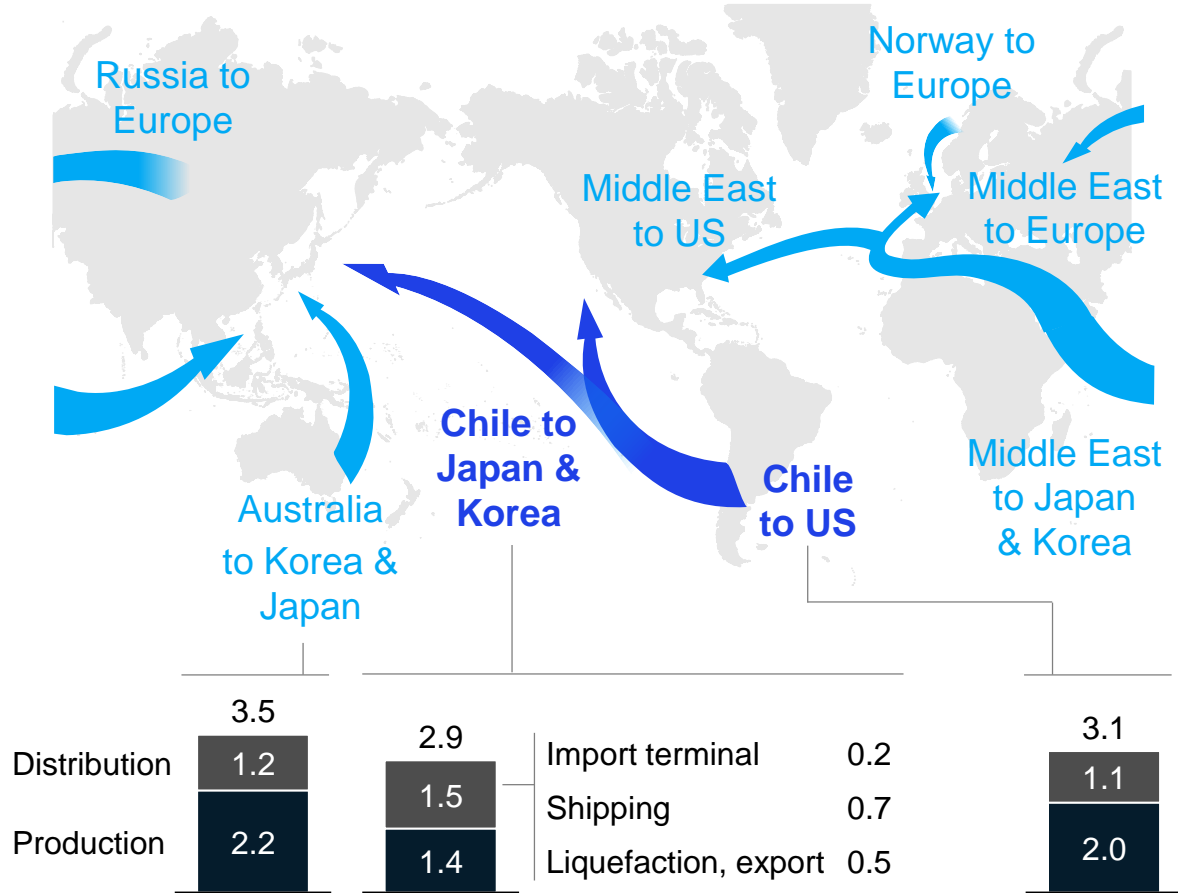


5. Chilean export to Asia could be competitive vs. Australia

Cost of liquid H₂ at destination harbor, USD/kg, 2030

Preliminary

Global hydrogen transport routes



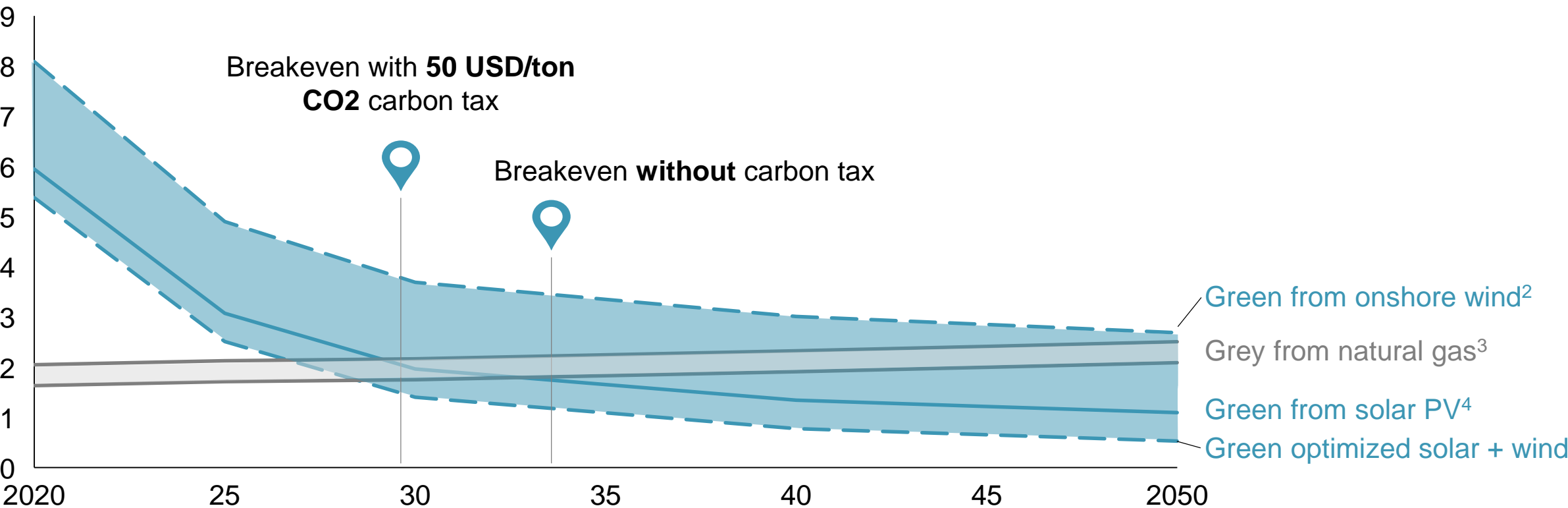
Hydrogen transport vectors

- LH₂** For distribution
Requires technical development
- CH₃** For medium distances
Leverage CNG infrastructure
- NH₃** For ammonia end-uses
Leverage existing infrastructure
- LOHC** Binds hydrogen in liquids
Binding/ unbinding requires energy
- LNG CO₂** H₂ reforming in target country
CO₂ return to CCS via shipping

5. Green H2 in Chile could become competitive vs grey H2 by 2030

Hydrogen production cost¹, USD / kg

Preliminary

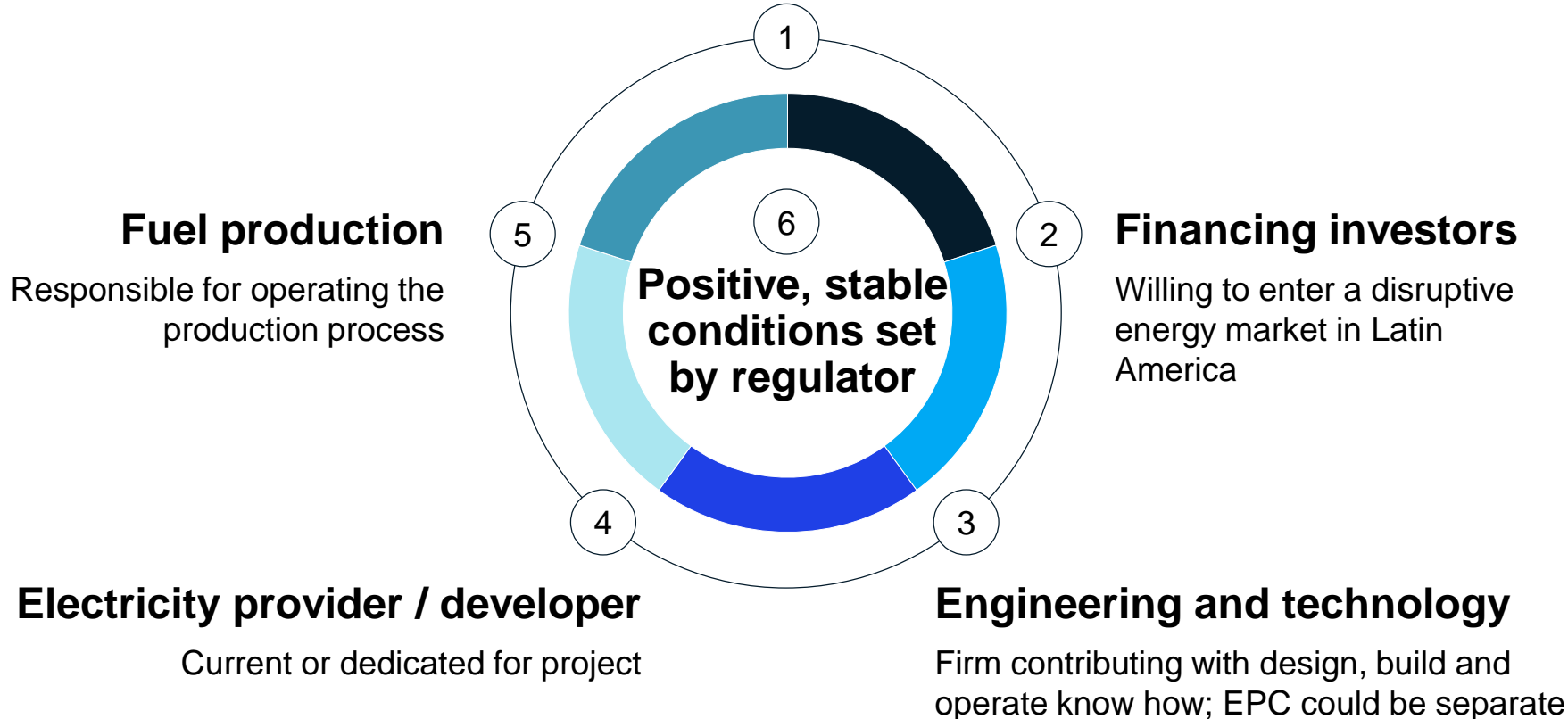


1. Based on 7% WACC
2. Based on onshore wind located in the South with 24% load factor and LCOE decreasing from 59 USD/MWh in 2020 to 46 USD/MWh in 2050
3. Based on steam methane reforming (SMR) and natural gas prices increasing from 8.13 USD/Mmbtu in 2020 to 11.22 USD/Mmbtu in 2050. High case includes 50 USD/ton CO2 carbon tax
4. Based on solar PV located in the North with 28% load factor and LCOE decreasing from 31 USD/MWh in 2020 to 12 USD/MWh in 2050

A multiparty coalition is required to produce significant amounts of green hydrogen

Offtaker group

Main stakeholders creating and leading the partnership and guaranteeing volume demand; could be also investor



Steps to follow

Develop business case

- Competitive cost of production
- Clear demand vs. other technical options

Build viable plan with timing

Identify gaps in technical capabilities required and

Attract funding

- Different ownership models
- Include financial players

Ensure regulatory certainty

- What are must haves
- Which risks can be taken on

Chile could provide a significant portion of the world's green hydrogen

Capturing 50% of Japanese and Korean market and 20% of China in 2050 would mean:

25 Mt H₂/year

>30 bn USD revenues/year

5% of global hydrogen demand

1% of global energy demand

Possible next steps to make it happen



Develop the business case for Chile: Export opportunities to build scale. Champions that want to lead locally (mining, airline, shipping). Secondary use cases that become cost efficient at marginal cost.



Articulate the overall vision: Where to start. Sequence in building out infrastructure. Public milestones and targets.



Define the regulatory framework: Required context to deliver the business case. Long-term certainty independent of political cycle. Right conditions to enable the investment.



Build multiparty coalitions: Build industry support for most promising cases. Bring the right players together from different sectors. Ensure international cooperation to bring expertise where required.