

THE FAST TRACK TO THE HYDROGEN ECONOMY

EUROPEAN HYDROGEN ENERGY CONFERENCE



URUGUAY GREEN HYDROGEN ROADMAP

Bilbao, March 2024



Ministerio
**de Industria,
Energía y Minería**

URUGUAY



Life expectancy at birth

77 years

Official language

Spanish

Surface area

176.215km²

Population

3,4 million

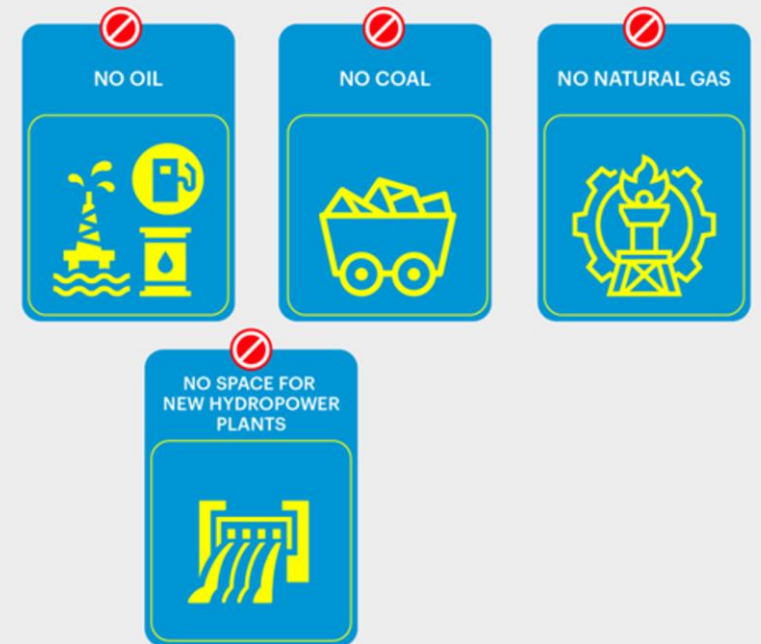
GDP

USD 63 thousand millions

Per capita GDP

USD 18.547

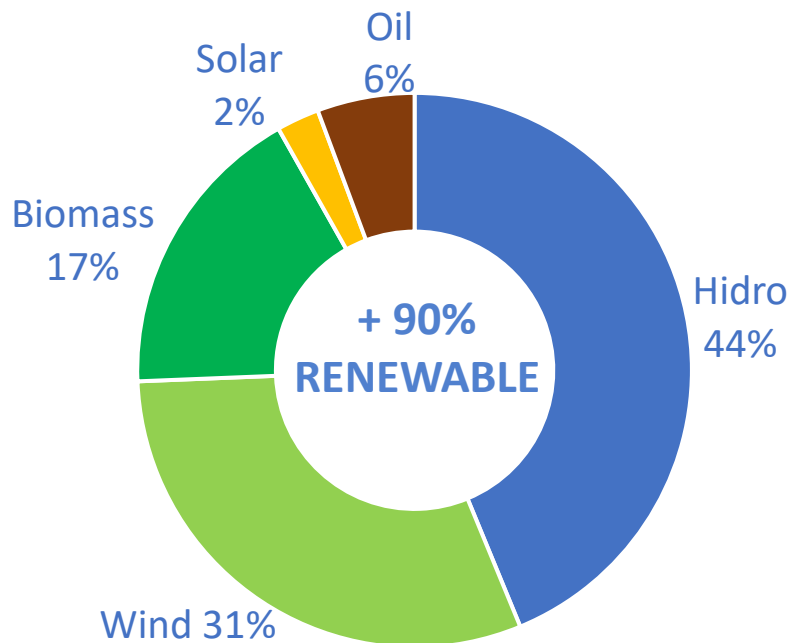
Energy sector in Uruguay



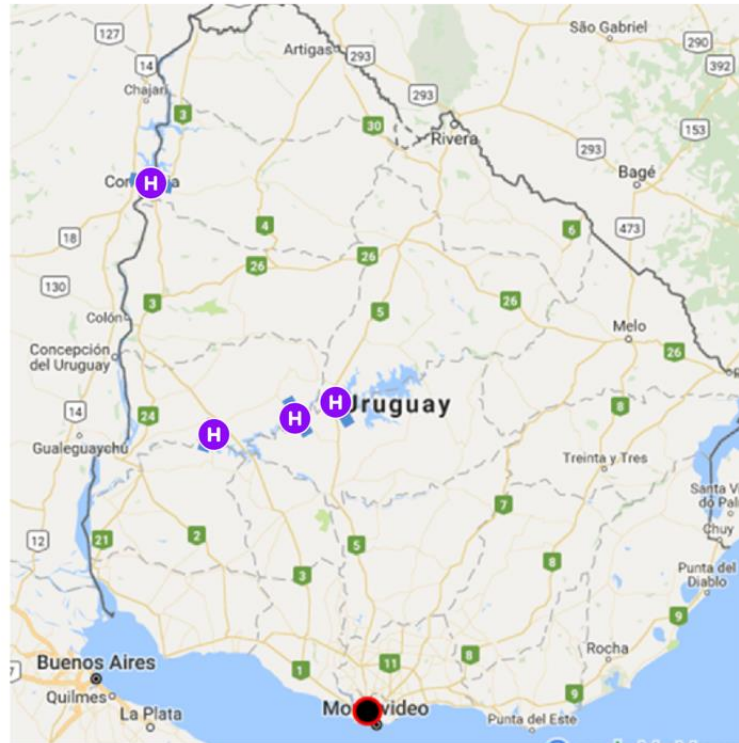
URUGUAY'S ENERGY SUCCESSION STORY

URUGUAY HAS SHOWN GREAT POTENTIAL

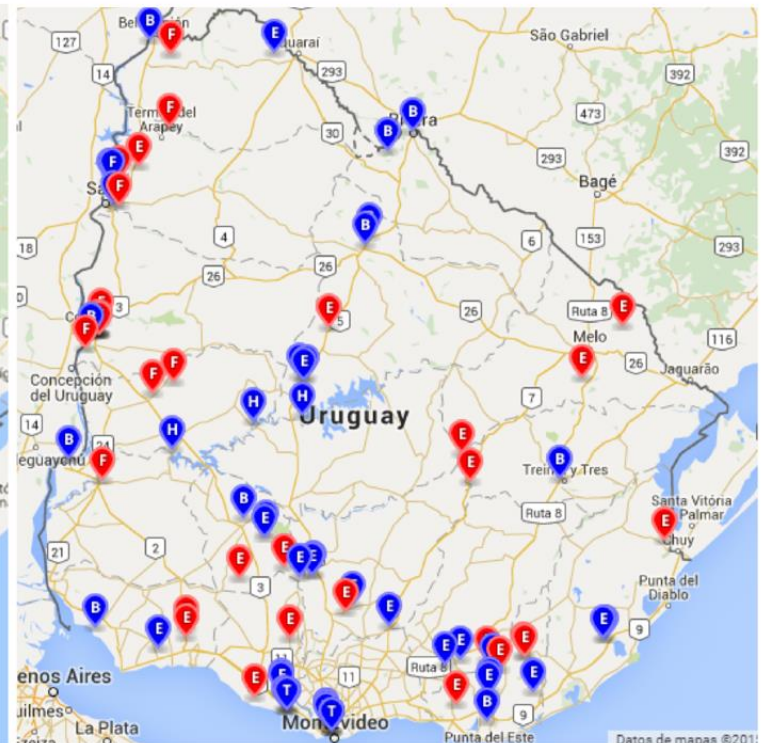
Urban and rural
electrification rate
99.9%



Power Generation
(before)



Distributed Power Generation
(now)

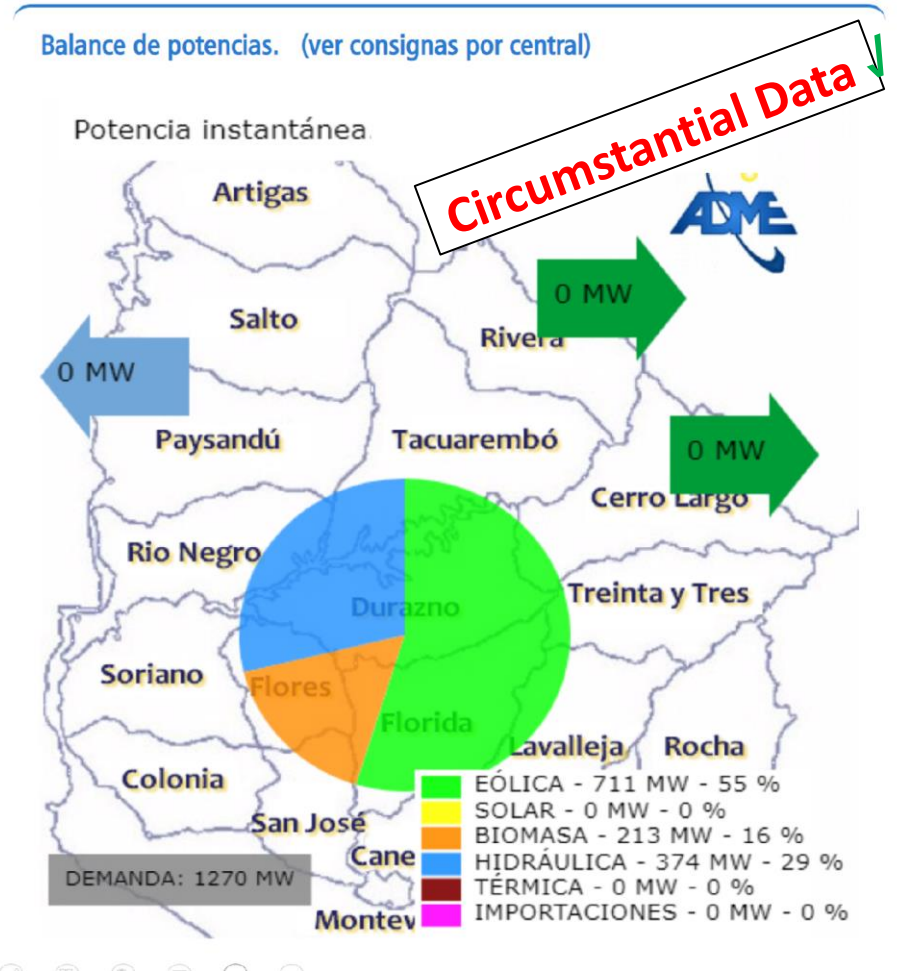
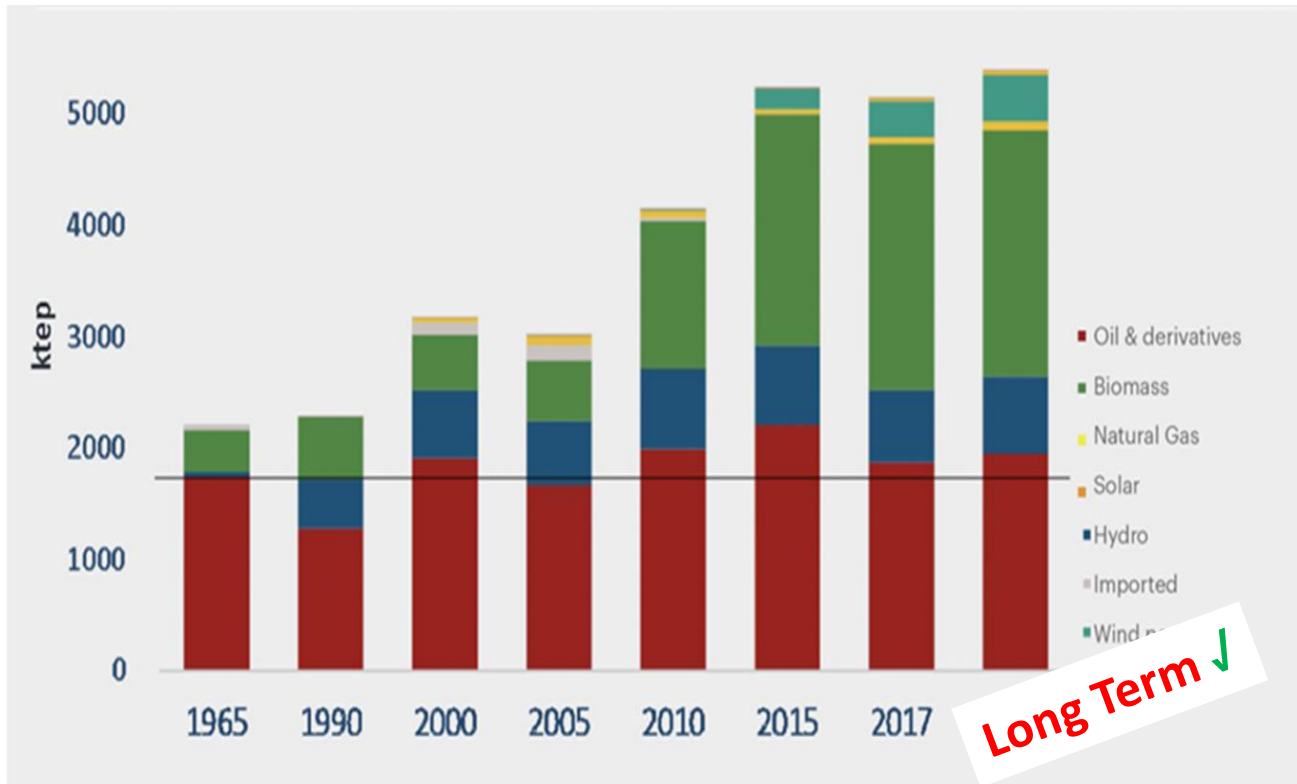


Over 90% renewable power over more than 5 years

URUGUAY'S ENERGY SUCCES STORY

LONG TERM & CIRCUMSTANTIAL DATA

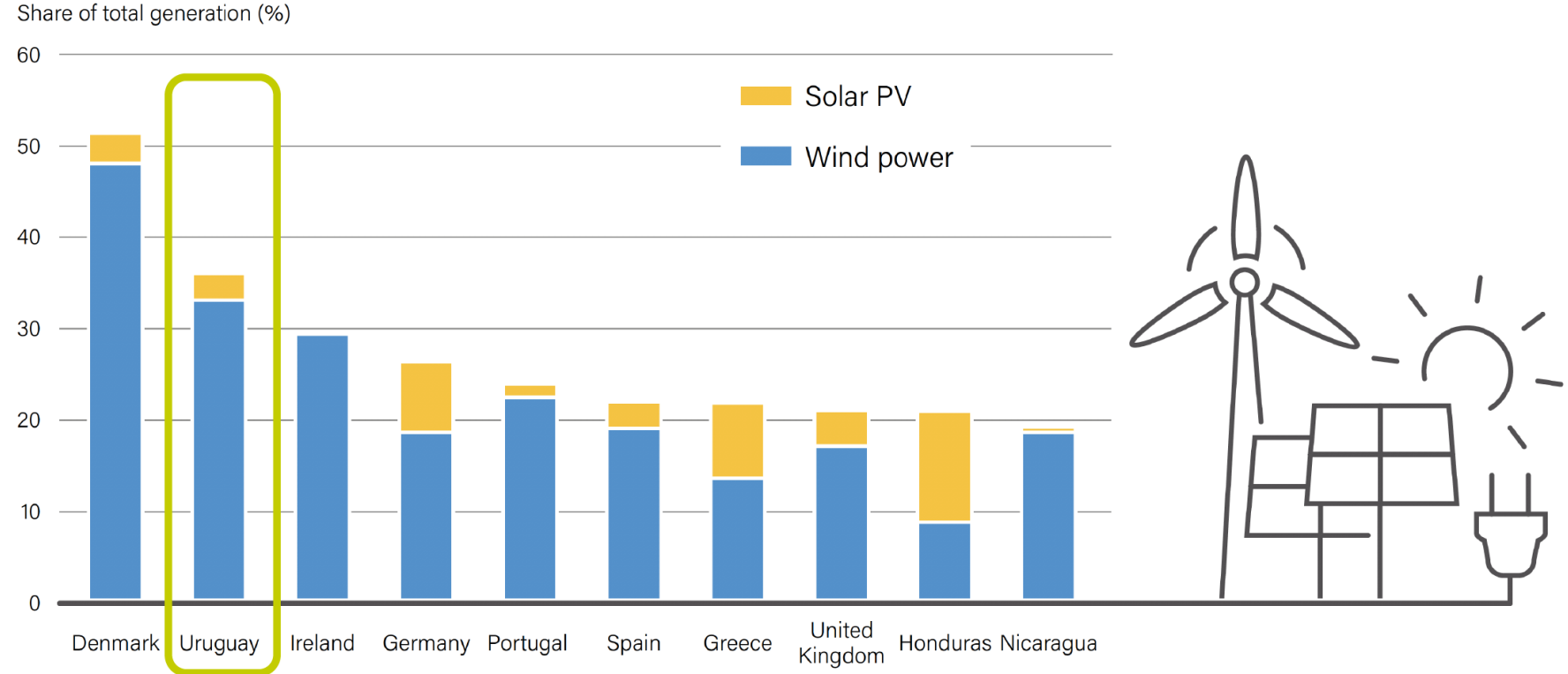
OIL CONSUMPTION HAS REMAINED VIRTUALLY UNCHANGED DESPITE THE GROWTH OF THE ECONOMY, THE INCREASE IN POPULATION AND THE EXPONENTIAL GROWTH OF THE VEHICLE FLEET OVER THE LAST 60 YEARS.



PRESENTATION 100 % RENEWABLE

URUGUAY IN THE INTERNATIONAL CONTEXT

Share of Electricity Generation from Variable Renewable Energy Top 10 Countries

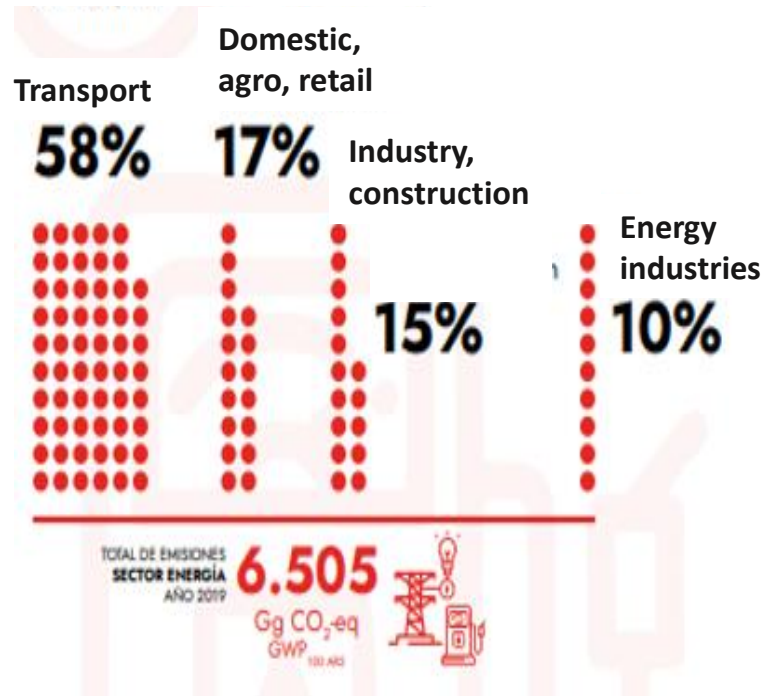


Note: This figure includes the top 10 countries according to the best available data known to REN21 at the time of publication.

URUGUAY CLIMATE CHANGE CHALLENGES

TODAY WE ARE MOVING TO OUR SECOND ENERGY TRANSITION: TRANSPORT AND INDUSTRY

CO₂ eq. energy emissions by sector



Transport Efficiency



Industry Efficiency



Biofuels
EtOH, Biodiesel



eficiencia energética



In this context: **Green Hydrogen**

4 ATTRIBUTES TO BEING A HYDROGEN PRODUCER/EXPORTER COUNTRY

POLITICAL, INSTITUTIONAL AND LEGAL STABILITY

Good ESG factor and investment grade, trust in institutions.

POWER GENERATION POTENTIAL AND COMPLEMENTARITY

Great potential to install new Power generation from combined wind and solar photovoltaic. Complementarity. Possibility of *offshore* expansión



LOGISTICS

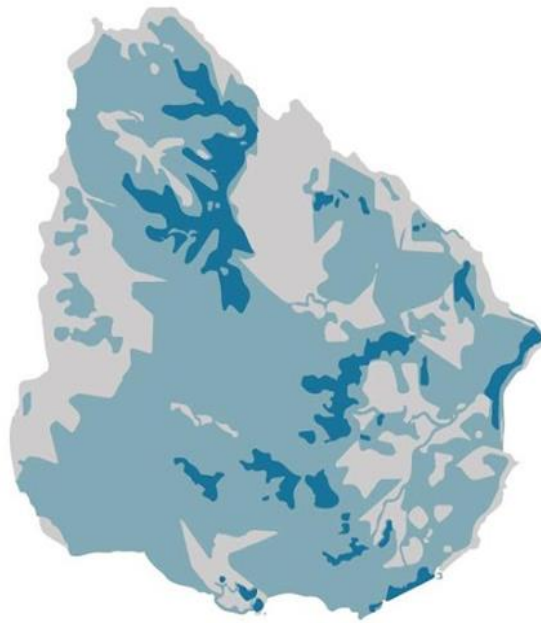
Ports with access to the Atlantic Ocean and internal logistics developed for transport derivatives of hydrogen (train, roads and rivers)

HIGH AVAILABILITY OF WATER AND biogenic CO_2

Access to biogenic CO_2 from industrial or power plants and availability of water throughout the country

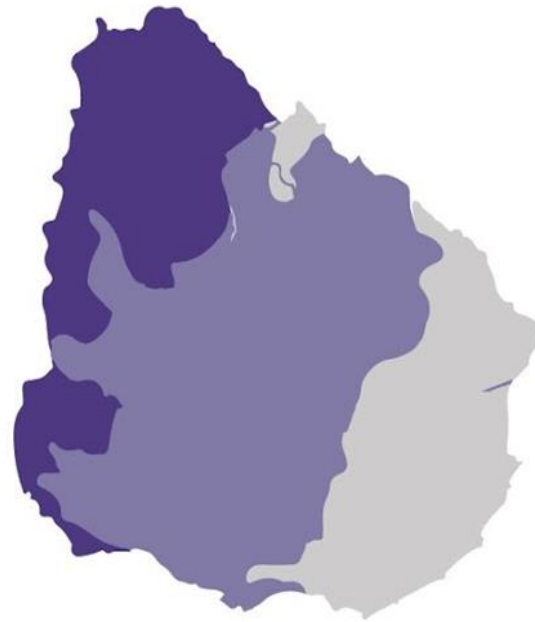
RENEWABLE GENERATION POTENTIAL *On Shore* for Tier 1 resources: ~60 GW SOLAR and ~30 GW WIND

Onshore and offshore wind capacity



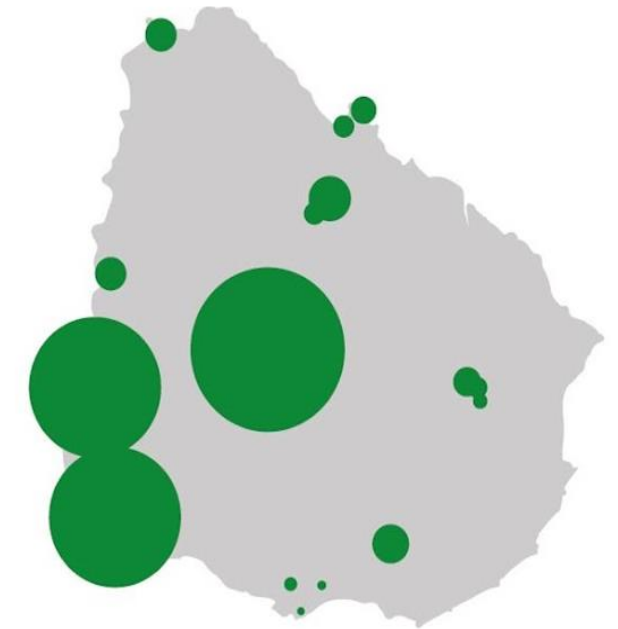
- Level I | >8m/s | ~30 GWs | Total area = 17,500 km²**
Assumptions: 15% of km² > ~10 MW/km²
- Level II | >7m/s | ~50 GWs | Total area = 97,300 km²**
Assumptions: 5% of km² > ~10 MW/km²
- Offshore | 275 GW**
Assumptions: 5% of km² > 20-30 MW/km²

Solar photovoltaic capacity



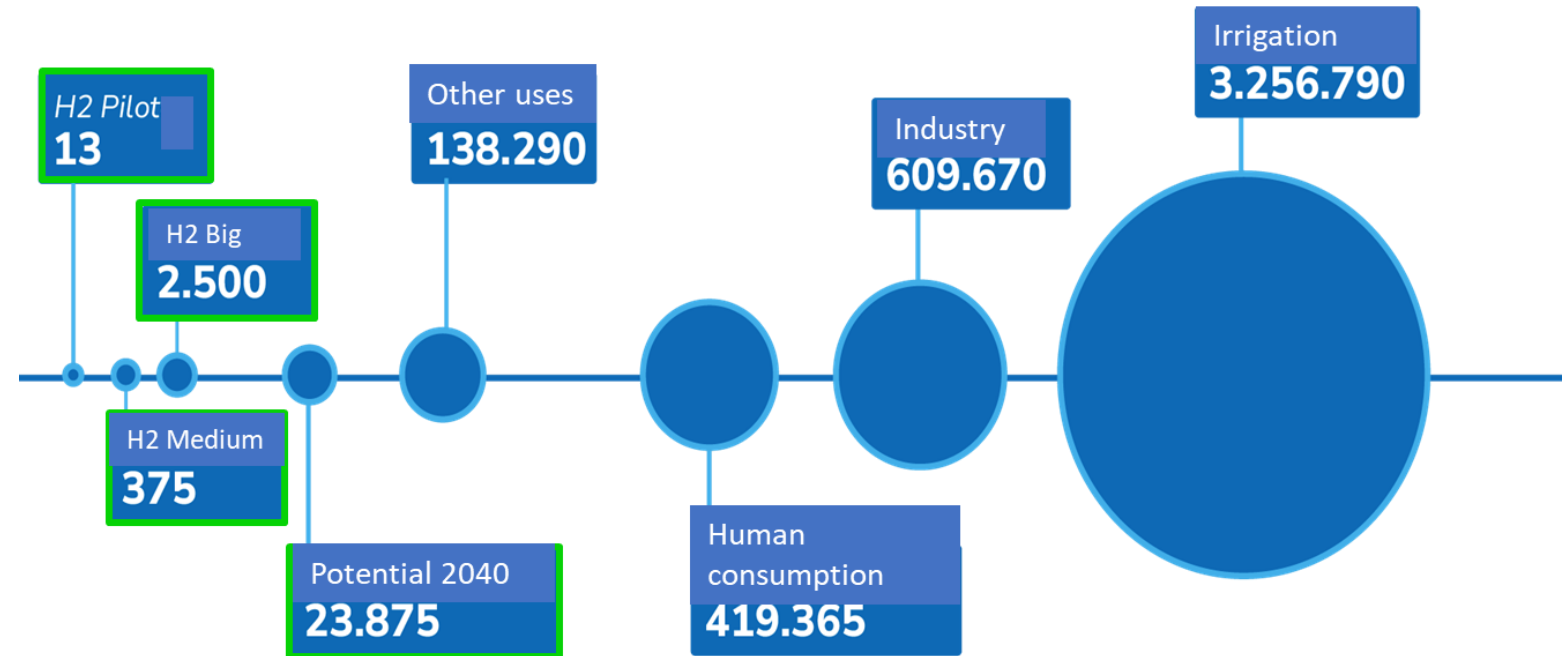
- Level I | ~60 GWs**
Total area = 31,500 + 6,500 = 38,000 km²
- Level II | ~135 GWs**
Total area = 81,400 km²

Biogenic CO₂ availability



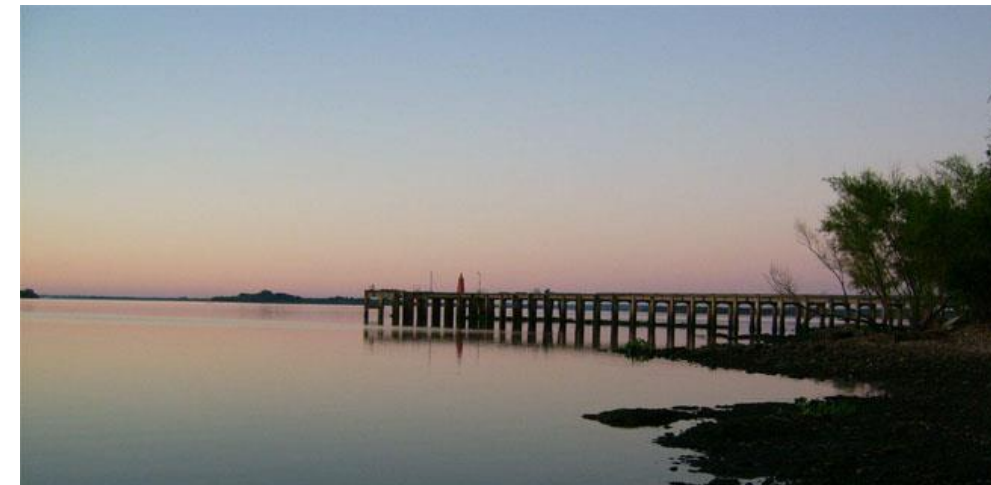
- Biogenic CO₂ availability

RENEWABLE RESOURCE: WATER

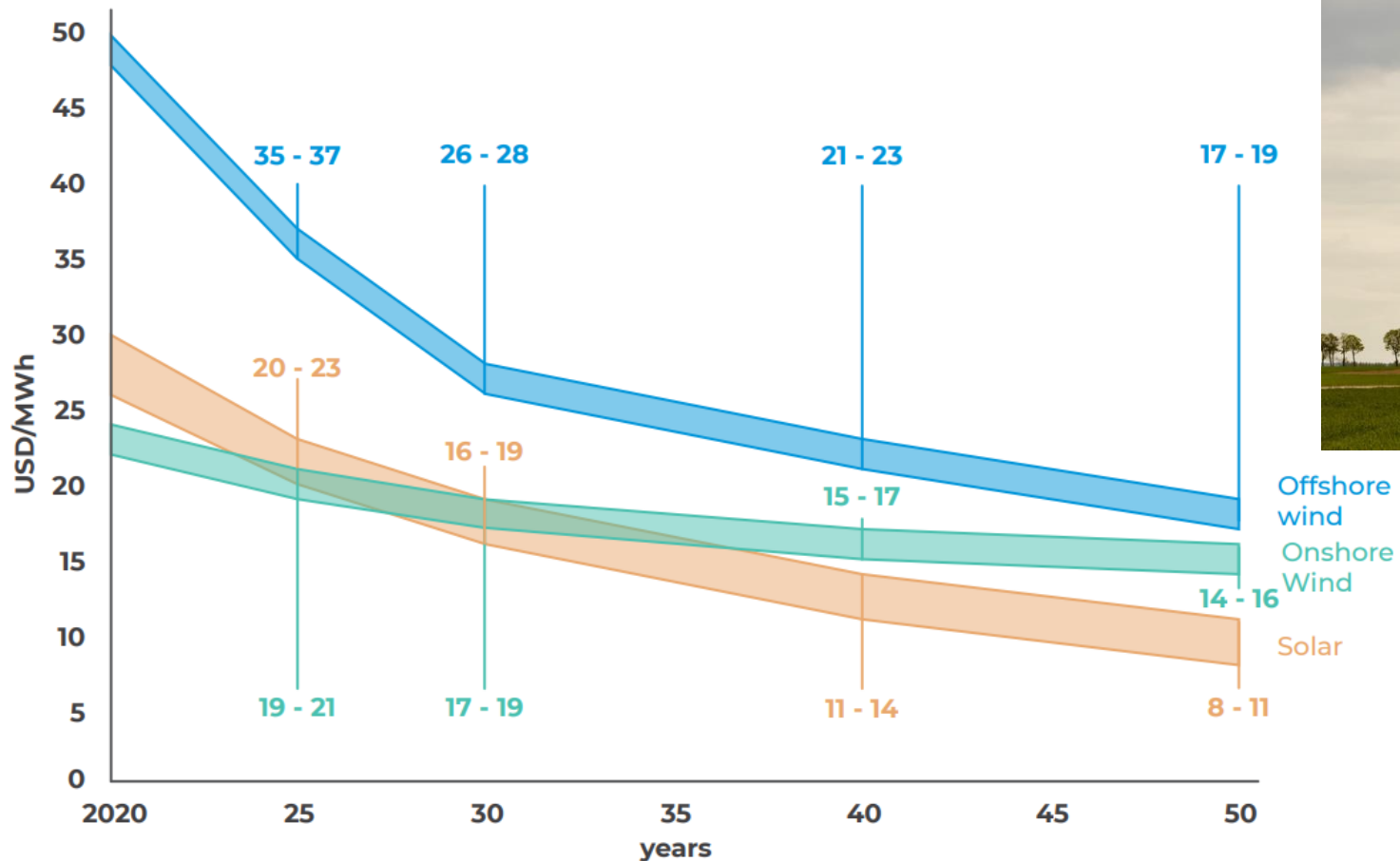


POTENTIAL WATER DEMAND 2040:

0.7% of irrigation
4% of the industrial sector



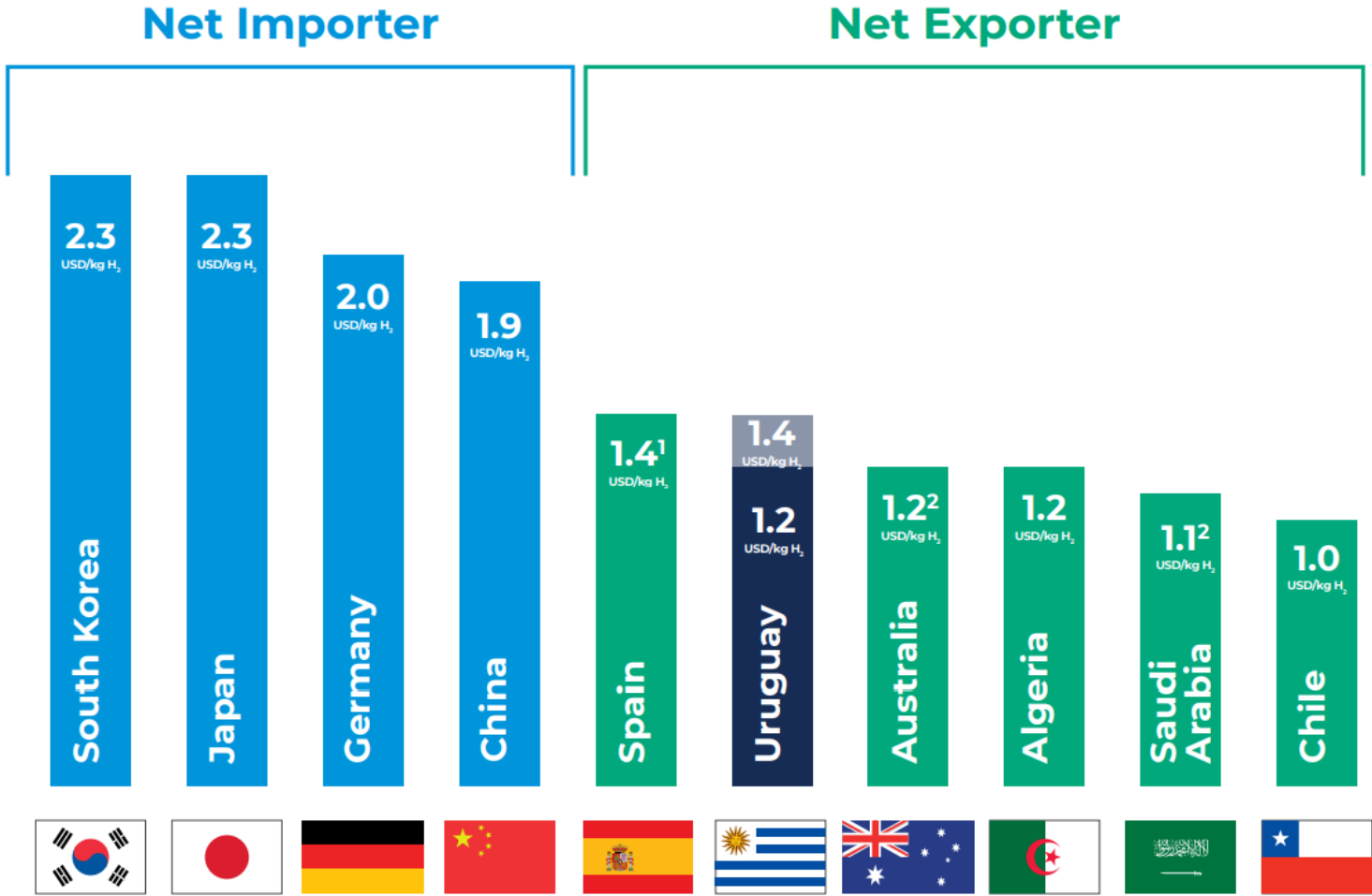
LCOE CAN REACH 16-19 USD/MWh BY 2030



Source: McKinsey & Company, 2021, in accordance with contract #: C-RG-T3777-P001 concluded with the IADB.



COMPARISON OF HYDROGEN PRODUCTION COSTS 2030

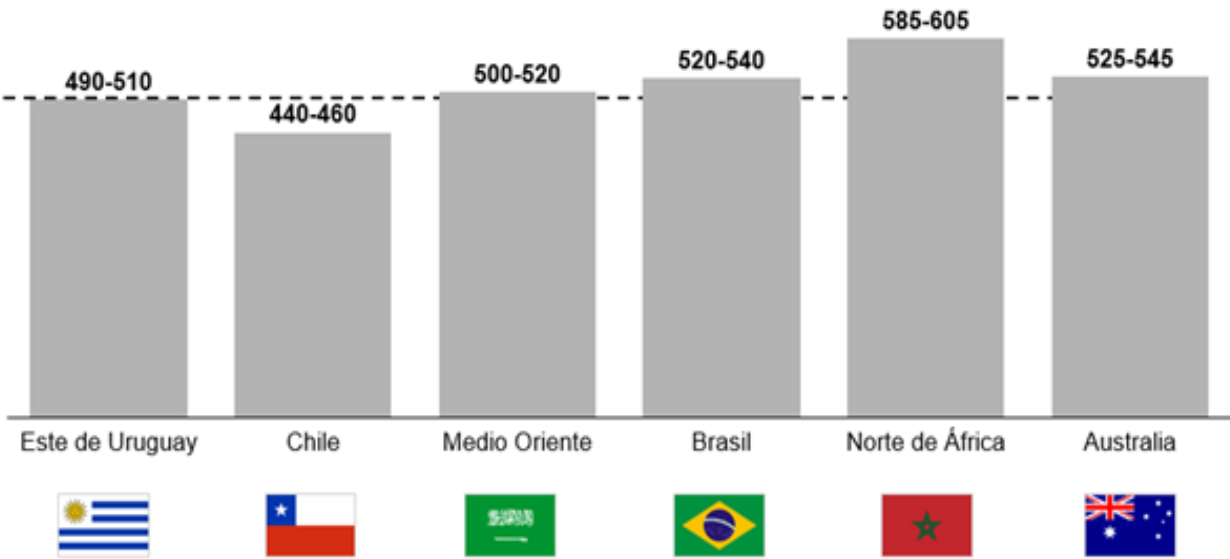


Source: McKinsey & Company, 2021, in accordance with contract #: C-RG-T3777-P001 concluded with the IADB.

IN THE SHORT AND MEDIUM TERM, GREATER EXPORT POTENTIAL: e-Methanol and e-fuels

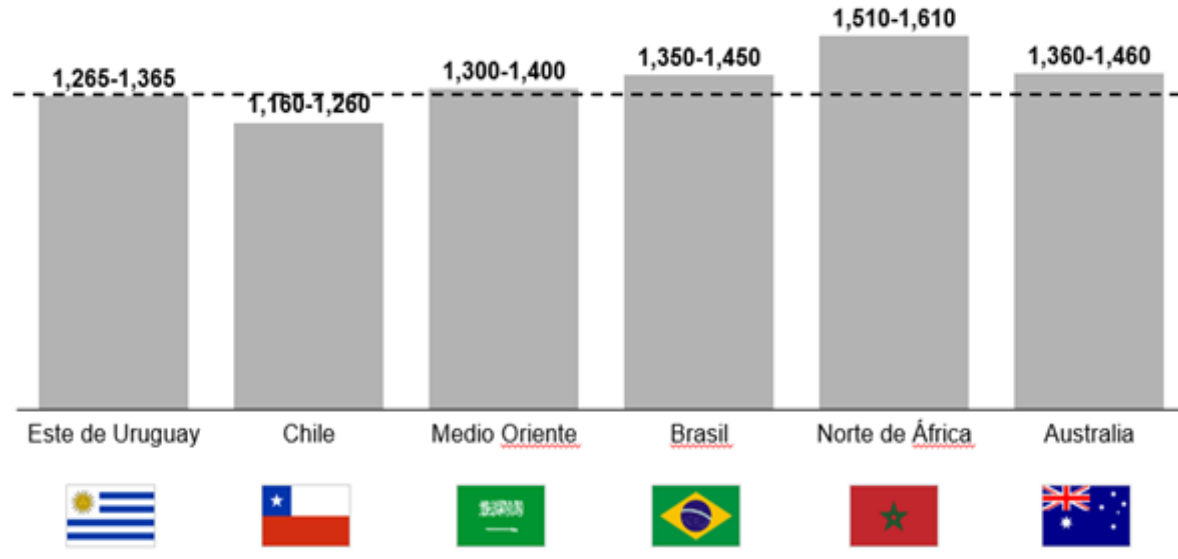
Methanol production cost

USD/ton - year 2030



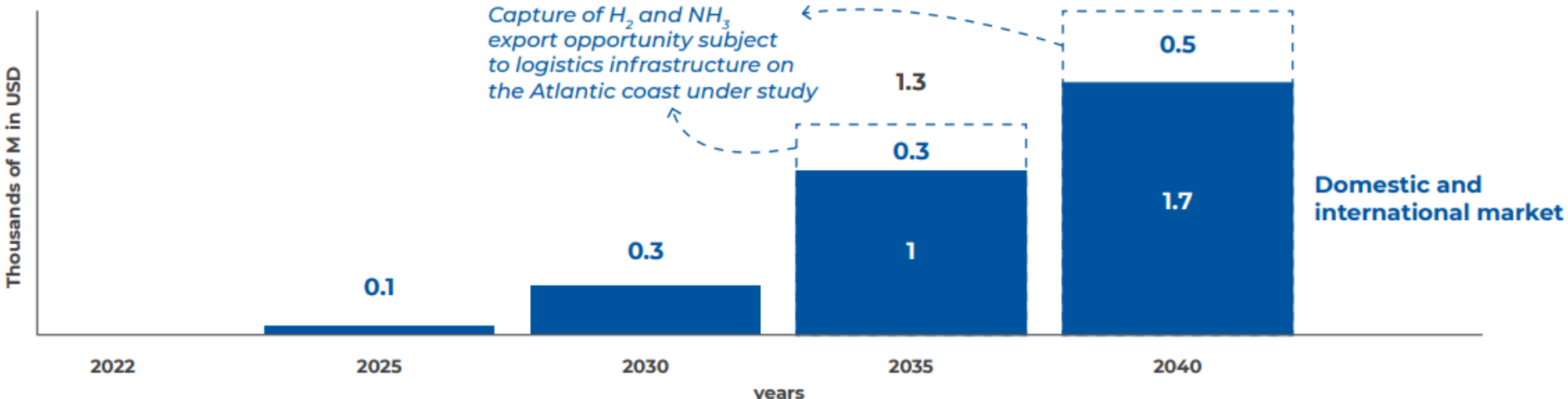
Jet Fuel production cost

USD/ton - year 2030



Source: McKinsey & Company, 2021, in accordance with contract #: C-RG-T3777-P001 concluded with the IADB.

2000 MILLION USD OPPORTUNITY IN GREEN HYDROGEN and DERIVATIVE PRODUCTS



0.1 - 0.3	1 - 2	5	10	Required electrolyzer capacity (GW)(GW)
0.2 - 0.5	2 - 4	11	20	GW of new RES capacity (including Wind PV and Solar) required

<p>Phase 1: Domestic and international market launch; development of regulation; infrastructure planning; promotion of H₂ in Uruguay.</p>	<p>Phase 2: Domestic expansion; attracting the first export-scale projects.</p>	<p>Phase 3 (potential): Full scale domestic market; accelerate export ramp-up.</p>
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Roadmap phases

Source: McKinsey & Company, 2021, in accordance with contract #: C-RG-T3777-P001 concluded with the IADB.

FOCUS: E-FUELS AND GREEN FERTILIZERS FOR INTERNATIONAL MARKET. DOMESTIC MARKET WILL BE DRIVEN BY EXPORT SCALE PROJECTS

2 billion USD market for 2040



First pilots:
2 – 25 MW Electrolyzers

First medium scale for exports in development:

- 150 - 300 MW Electrolyzers
- 200 - 500 MW Renewable energies



1 - 2 GW Electrolyzers

2 - 4 GW Renewable energies

Expansion nationwide, export of derivatives



9 GW Electrolyzers

18 GW Renewable energies

Synthetic fuels, hydrogen, ammonia

DOMESTIC: HEAVY DUTY TRANSPORT (FCEV)

EXPORT: E-FUELS, METANOL AS RAW MATERIAL, GREEN FERTILIZERS

PROJECTS IN FEASIBILITY STUDY STAGE



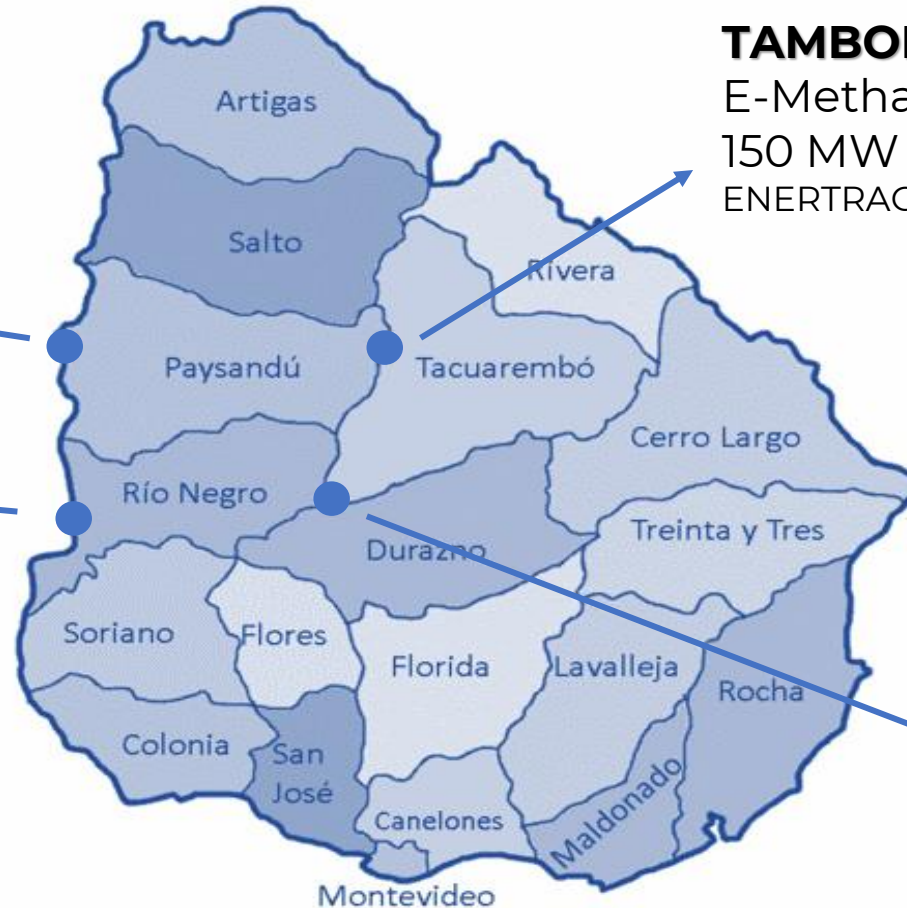
HIF PROJECT

E-Methanol + E-Gasoline
1 GW Electrolyzer



KAHIRÓS PROJECT

Transport (trucks)
2 MW Electrolyzer
Ventus, Fraylog



TAMBOR PROJECT


E-Methanol
150 MW Electrolyzer
ENERTRAG Company



PILOT PROJECT H24U

Transport (trucks)
5 MW Electrolyzer
SACEEM/CIR
Call for proposals:
ANII/LATU/MIEM

SOCIOECONOMIC and ENVIRONMENTAL IMPACT

		2030	2040	
	Lay the basis for country's long-term growth	Annual turnover in thousands of M USD	0.3	2
		Potential turnover over projected future GDP	+0.5%	+2%
	Create +34K skilled jobs: qualified technicians, operators and engineers	Jobs created in thousands	+6	+34
		Total accumulated investment in thousands of M USD	2.5	19
	Eliminate the equivalent of Uruguay's net emissions by 2040	MtonCO ₂ annual emissions reduced	0.6	7

Source: McKinsey & Company, 2021, in accordance with contract #: C-RG-T3777-P001 concluded with the IADB.

PROGRAM



Roadmap for green hydrogen and its derivatives in Uruguay

5

**MAIN LINES
OF ACTION**



Capacity building



Regulation



Investments



Infrastructure



Social dialogue

2040

REQUIREMENTS



9 GW
POWER
ELECTROLYZERS

18 GW
RENEWABLE
ENERGY



1 MILLION TON
ANNUAL GREEN
HYDROGEN PRODUCTION



USD
18,000:
EXPECTED INVESTMENT

+30,000
DIRECT
JOBS

POTENTIAL MARKETS



USD
1,300:
EXPORT MARKET



USD
540:
DOMESTIC MARKET



Green Hydrogen Roadmap in Uruguay



Ministerio
de Industria,
Energía y Minería

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Thank you for your attention!...



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