H-NAT

POTENTIAL • EXPLORATION • PRODUCTION

Natural **H**ydrogen in **Uruguay**

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Pablo Gristo
Santiago Ferro

Thursday, 13th November – Paris

WWW.HNATWORLDSUMMIT.COM | in

ANCAP

The information included in this presentation and all other communication material regarding bidding terms, contract model, schedule, regions and areas is tentative and should be considered as a draft. The official and final version of this information will be released once the bidding terms are approved and published. November 2025

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AGENDA

- Energy Transition in Uruguay and ANCAP
- Natural Hydrogen Exploration Framework
- Natural Hydrogen Prospectivity in Uruguay

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AGENDA

- Energy Transition in Uruguay and ANCAP

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Uruguay XXI
INVESTMENT, EXPORT AND COUNTRY BRAND PROMOTION AGENCY

UNIQUE COMBINATION OF ATTRIBUTES

Reliability & Certainty

- Stability - Transparency
- Sustainability - ESG
- World class infrastructure

Easy for business

- Markets & Clients access
- Financial freedom & Incentives
- Innovation ecosystem

Talent & Lifestyle

- Multilingual - Flexible - Creative
- Peaceful - Diverse - Safe

Uruguay in Latin America

Uruguay

Democ racy
(Economist Intelligence Unit, 2024)
#1

Rule of L aw
(World Justice P roject, 2024)
#1

Low corruption
(Transpa rency International, 2024)
#1

Social Mobility
(World Economic Forum, 2020)
#1

Civil Libe rties
(Freedom House, 2025)
#1

E-Government
(United Nations, 2024)
#1

#1

The best quality of life in Latin America (Mercer)

Uruguay | LIVE THE EXPERIENCE

liveinuruguay.uy

Health

Education

Commuting

Recreation

Investment promotion law

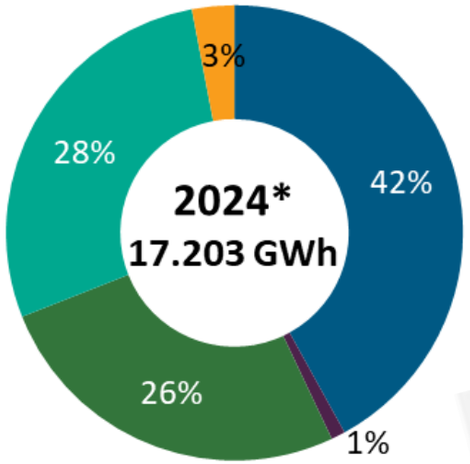
CORPORATE INCOME TAX	30% -100% of investment	4 - 25 years
EQUITY TAX	Exemptions for 8 -10 years	
VAT	VAT refund	
IMPORT TAXES	100% exempt	

Indicators

- Employment
- Decentralization
- R & D
- Exports
- Clean Technologies
- Sectoral Indicator

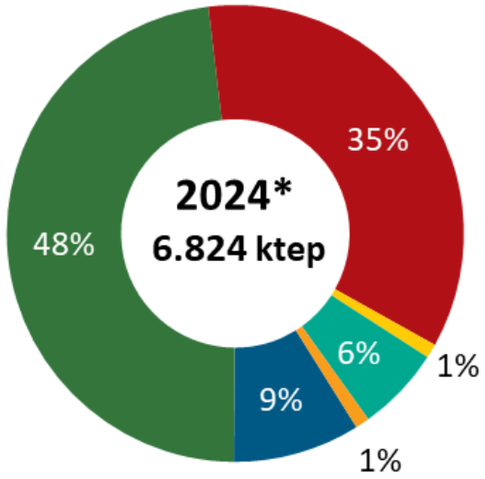
Uruguay – Energy Mix in 2024

Electricity



- Solar
- Wind
- Thermal - Traditional Biomass
- Thermal - Fossil Fuels
- Hydropower

Primary Energy



- Solar
- Wind
- Imported Power
- Natural Gas
- Petroleum and Derivatives
- Traditional Biomass
- Hydro

Advanced in energy transition

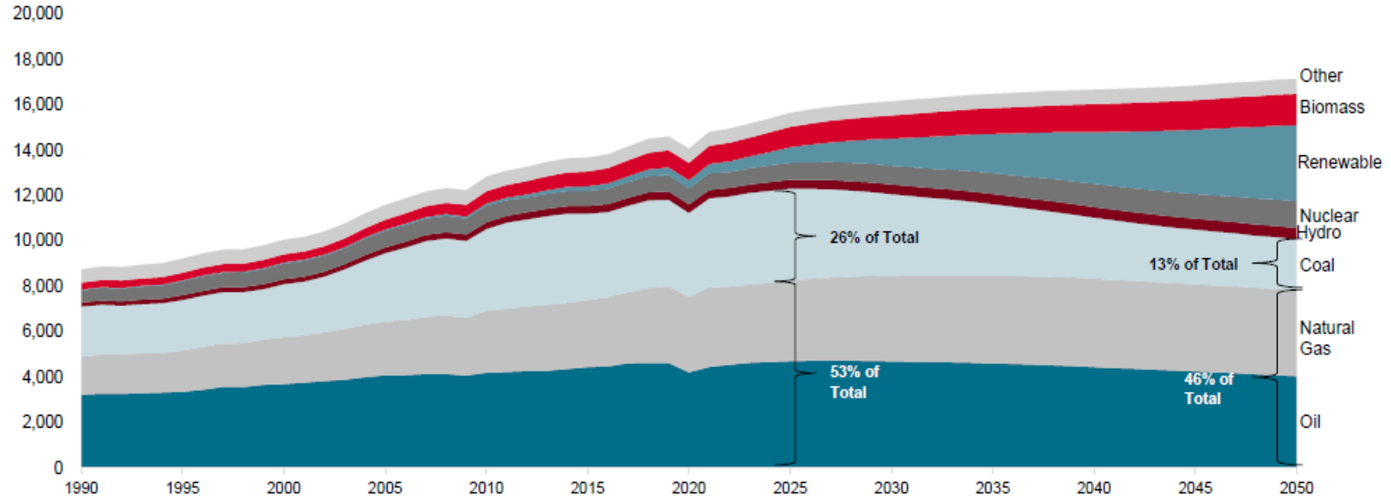
But petroleum still significant in our primary energy mix and our economy!

Upstream Survival or Revival

Global demand requires survival: not energy Transition, rather energy Addition

Primary energy demand (Mtoe)

Inflections scenario

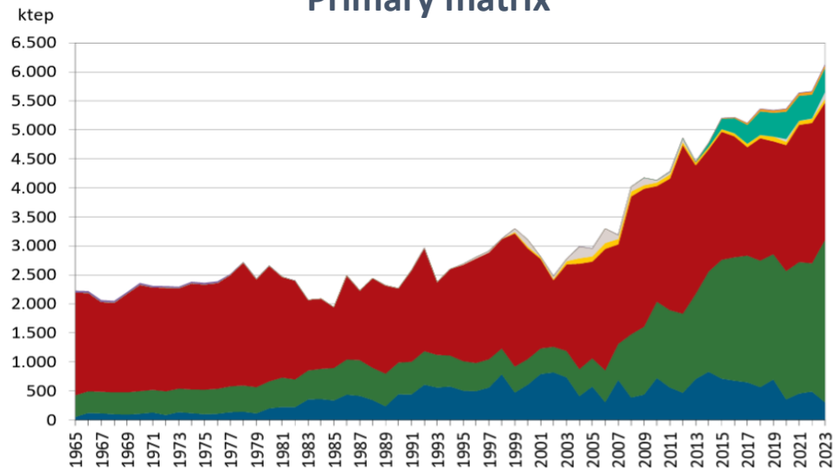


Source: July 2024 - Energy and Climate Scenarios

S&P Global Commodity Insights

© 2025 S&P Global.

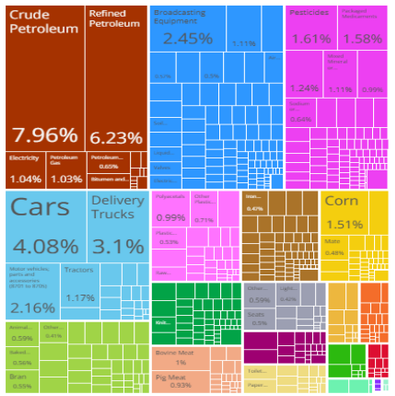
Primary matrix



https://ben.miem.gub.uy/descargas/1balance/Presentaci%C3%B3n%20BEN2023.pdf

Uruguay Total Imports in 2023

Total: $13.5B



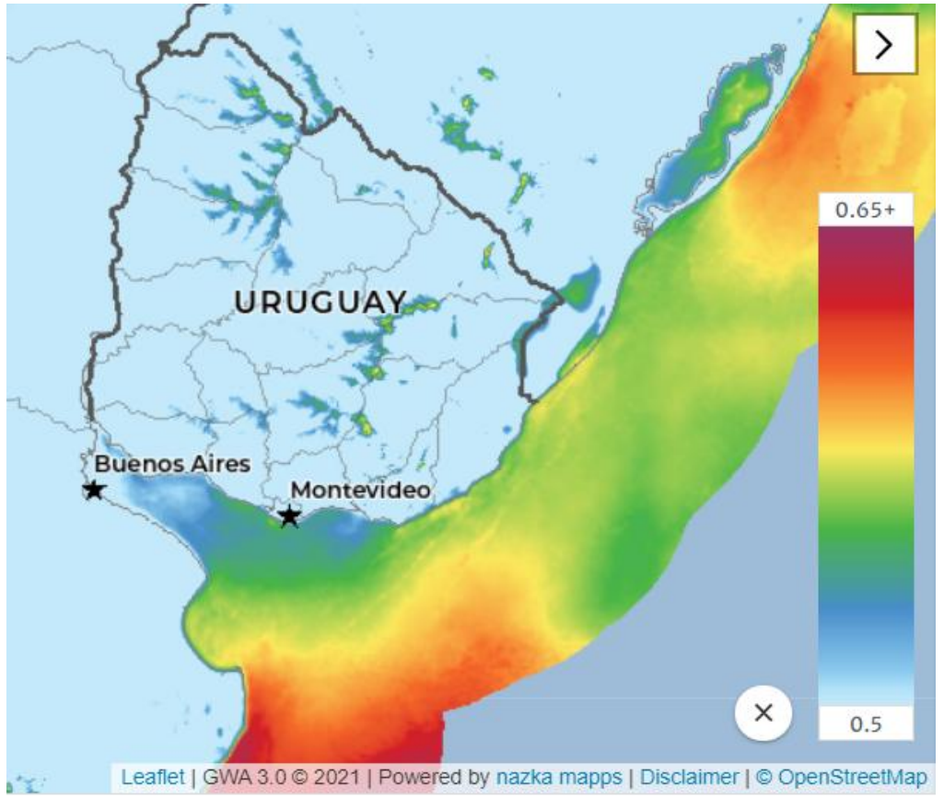
	2023
electricidad origen hidro	5%
biomasa	46%
petróleo y derivados	38%
gas natural	1%
electricidad importada	2%
electricidad origen eólica	7%
solar	1%
otros	0%

https://oec.world/profile/country/ury?yearlyTradeFlowSelector=flow1&yearSelector1=2023#yearly-trade

ANCAP

Excellent conditions to keep advancing in energy transition

- Renewable potential
  - On land: 30 GW of Tier I wind and 60 GW of Tier I solar, with high complementarity
  - Offshore: 275 GW of wind
- Biomass residues of forestry and agricultural origin as a source of biogenic CO_2
- Water resources
- Feedstocks for biorefinery
- Projects to produce e-fuels and biofuels



[Data/information/map obtained from the] "Global Wind Atlas 3.0, a free, web-based application developed, owned and operated by the Technical University of Denmark (DTU). The Global Wind Atlas 3.0 is released in partnership with the World Bank Group, utilizing data provided by Vortex, using funding provided by the Energy Sector Management Assistance Program (ESMAP). For additional information: https://globalwindatlas.info"

The offshore of Uruguay has excellent wind conditions considering both mean wind speed (exceeding 8.8 m/s at 100m hub height) and capacity factors (higher than 52% for IEC Class I) (Global Wind Atlas, 2025).
https://globalwindatlas.info/en/

ANCAP – The Uruguayan NOC Role

- ANCAP acts in coordination with DNE-MIEM as the “hydrocarbon agency”, competent to manage the activities, business and operations of hydrocarbons industry, by itself or by third parties
- ANCAP will sign with the IOCs the Exploration-Exploitation Contract after approval and on behalf of the República Oriental del Uruguay Executive Branch
- Vertically integrated Oil Company
- Key actor for the 2nd Energy Transition in Uruguay, for which green Hydrogen and its derivatives (sustainable fuels) are pillars

Enabling the new phase of Energy Transition in Uruguay

ANCAP Group: The largest industrial conglomerate in Uruguay

We have key assets to make energy transition projects viable

Production and sale of energetics

Fuels
50.000 barrels/day

Biofuels
140.000 m3/year

Lubricants
16.000 m3/year

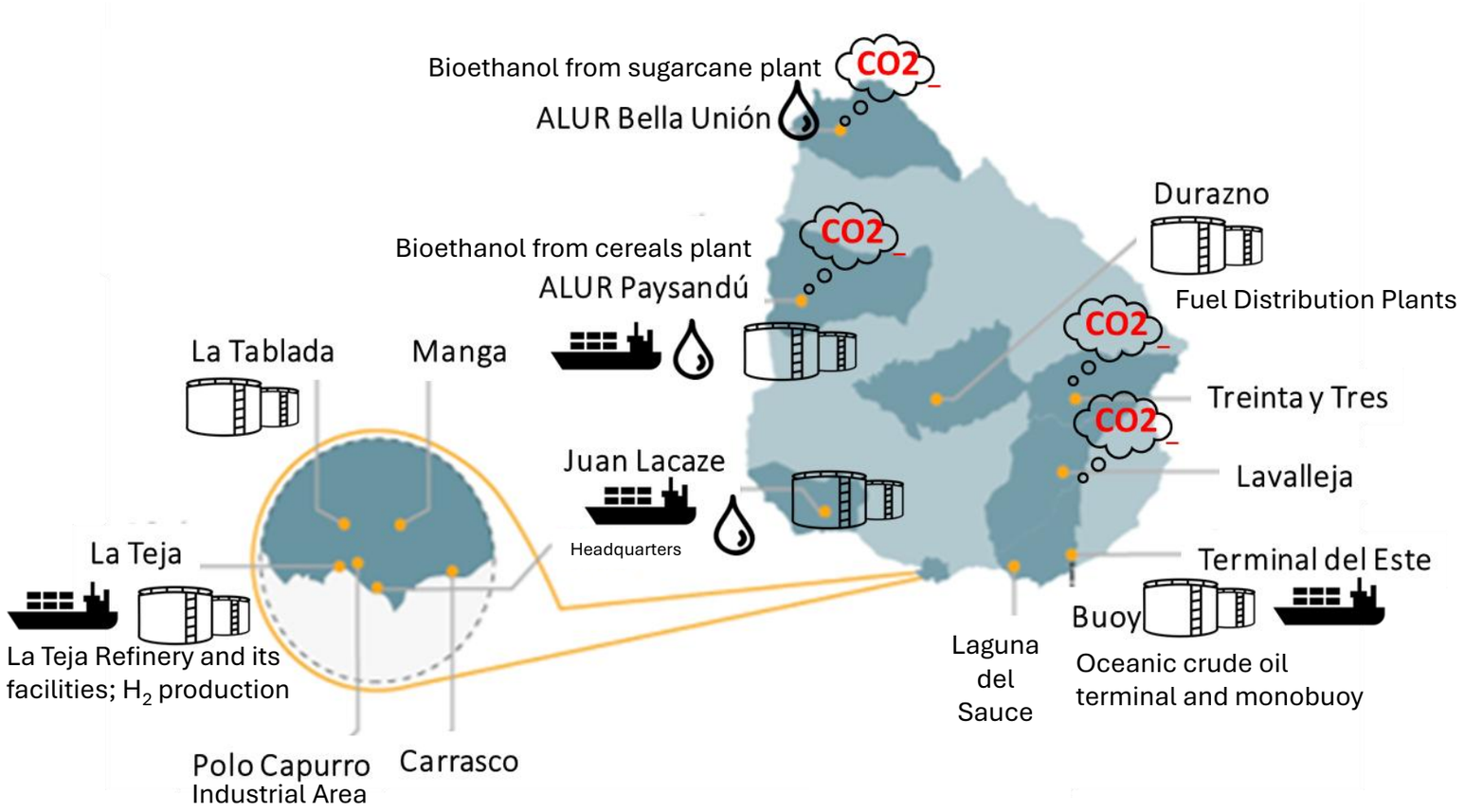
Gas Station
Network 285

Natural Gas
250.000 m3/day

Industrial Plants
18

Employees
3300

2023 Results
3296 MMUS$
Gross Income



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ANCAP: Hydrocarbons **and** Sustainable Fuels

Hydrocarbons E&P

Decarbonization of current operations

Green Hydrogen Offshore

ALUR: biofuels production

Production of HVO / SAF

Natural Hydrogen E&P

Production of E-fuels

CO2 storage in saline reservoirs

Production of Green Hydrogen for FCETs

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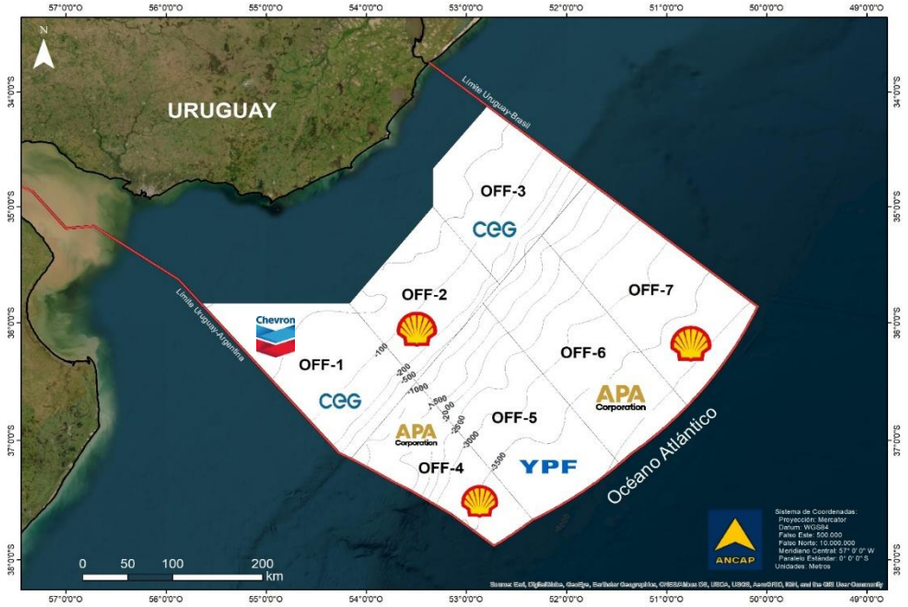
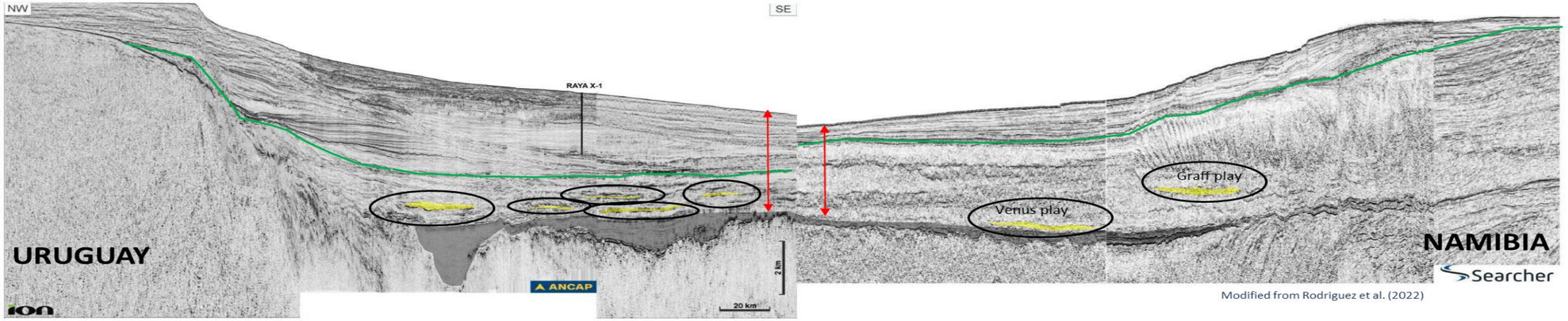
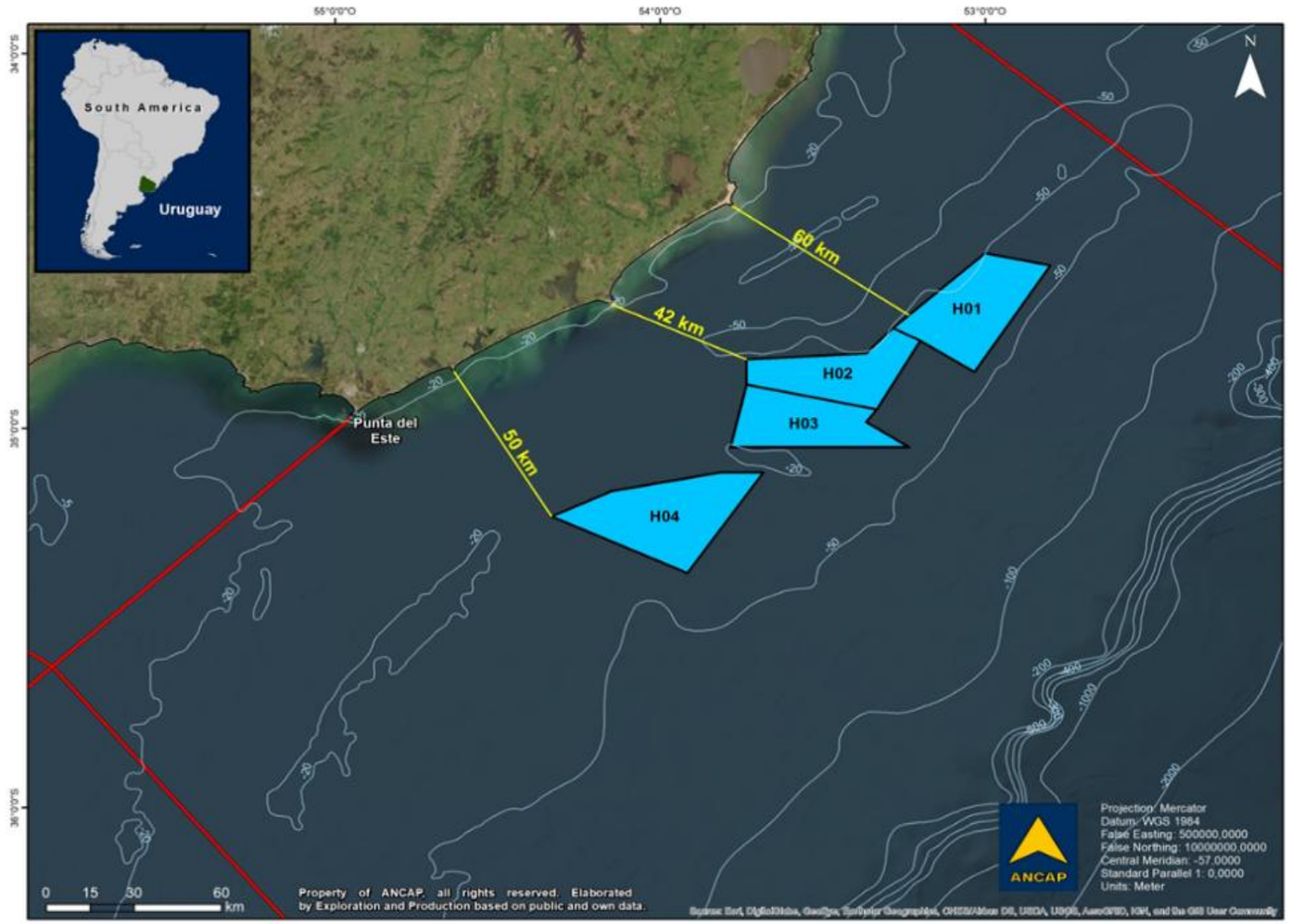
Update on E&P activities



- MCMs
- Farm ins
- Investment: 129 MMUS$
- Exploration Activity includes:
  - working with existing data: seismic interpretation, basin modelling, prospect definition, volumetrics
  - acquisition of 2500Km^2 of 3D seismic (OFF-4) + 3500Km^2 of 3D seismic (OFF-1)
  - Deep-water exploratory well in block OFF-6



H_2U Offshore



Project to produce HVO / SAF - ANCAP & ALUR

Flexibility of feedstocks, products and markets

Value Chain of production of biofuels (SAF or HVO) through the HEFA route

+ Feedstock supplier

+ Supplier of the service of crushing and / or pretreatment

Offtaker

Feedstock:

Crushing

Pretreatment

156,233 ton/year

HEFA Plant

150,000 ton/year

H_2 from the refinery

The HEFA plant has the capacity to receive at least 150.000 ton/year of pretreated oil

HVO

SAF

The HEFA process is flexible, SAF and HVO can be produced. The target market will be subject to the type of feedstock and certifications obtained.

Cousa and Capurro plants

La Teja Refinery

Strategic Partners

Production of Green H_2 for FCETs (Fuel Cell Electric Trucks)

Hydrogen Truck Pilot as a Strategic Step to Develop, Scale, and Consolidate a Heavy-Duty Mobility Ecosystem Based on Green Hydrogen. It will enable the validation of technologies, contractual models, and operational capabilities that will support future phases of expansion, both in terms of territorial coverage and the number of users and sectors involved.

Pre-Feasibility Study – Hinicio
Location: Capurro
Plant: Production, Conditioning, and Dispensing
Pressure: 350 Bar
Electrolysis Capacity: Approx. 1 MW
Fleet: 2 or 3 cargo trucks, ANCAP fleet (plus others?)
Destinations: Medium distance (Durazno, Treinta y Tres, Paysandú)
Investment: Aprox. 10 MMUS$
Start of Operations: 2028
Second Phase: Capurro–Paysandú (with additional HRS)

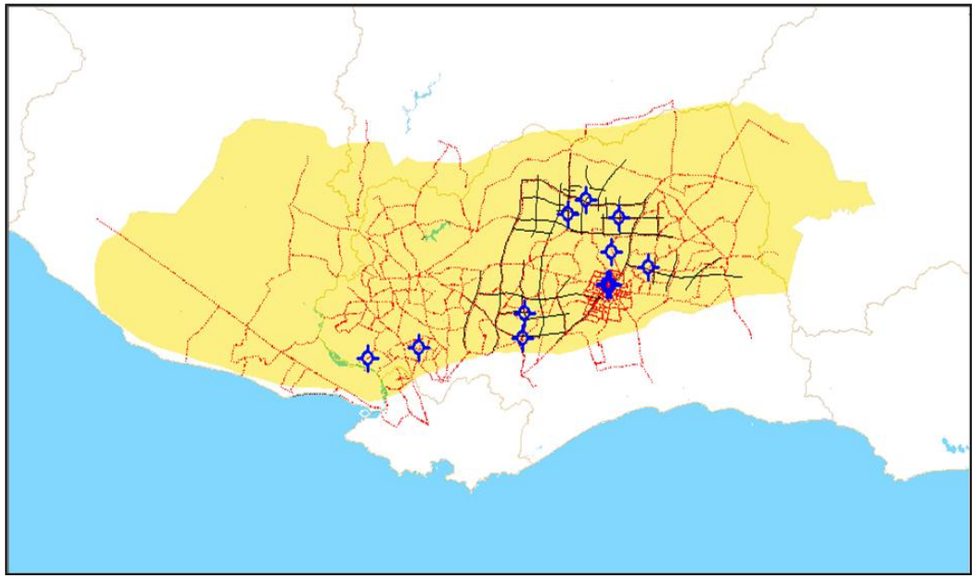
Underground storage of fluids in saline reservoirs

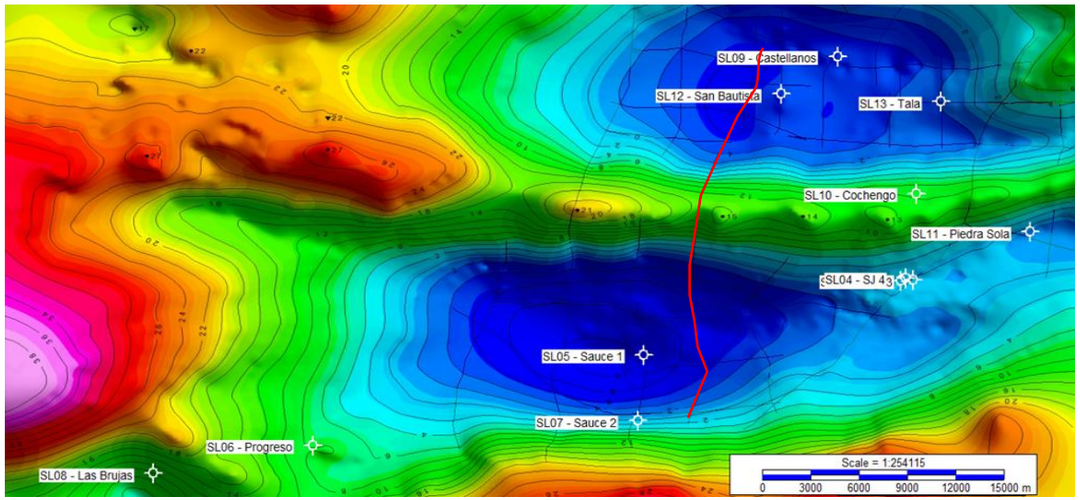
CO_2, Hydrogen, Natural Gas

- **Year 2026**
- Discuss with MIEM ANCAP's role
- Understanding CCUS business
- Training
- Networking

- **Year 2027**
- Research Agreements
- Draft Bidding Round Terms CCS
- Approval MIEM
- Multiclient agreements

- **Year 2028 & 2029**
- Launch CCS bidding Round
- Signature of contracts





ANCAP: Hydrocarbons **and** Sustainable Fuels

ANCAP supplies the fuels currently demanded in Uruguay and will continue to do so for several decades (oil, derivatives, natural gas, bioethanol, and biodiesel), while reducing its carbon footprint. At the same time, it leads the development of sustainable molecules—such as natural hydrogen, green hydrogen, e-fuels, e-methanol, renewable diesel, and SAF—that are beginning to gain market demand and will see increasing consumption in the medium and long term.

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- Natural Hydrogen Exploration Framework

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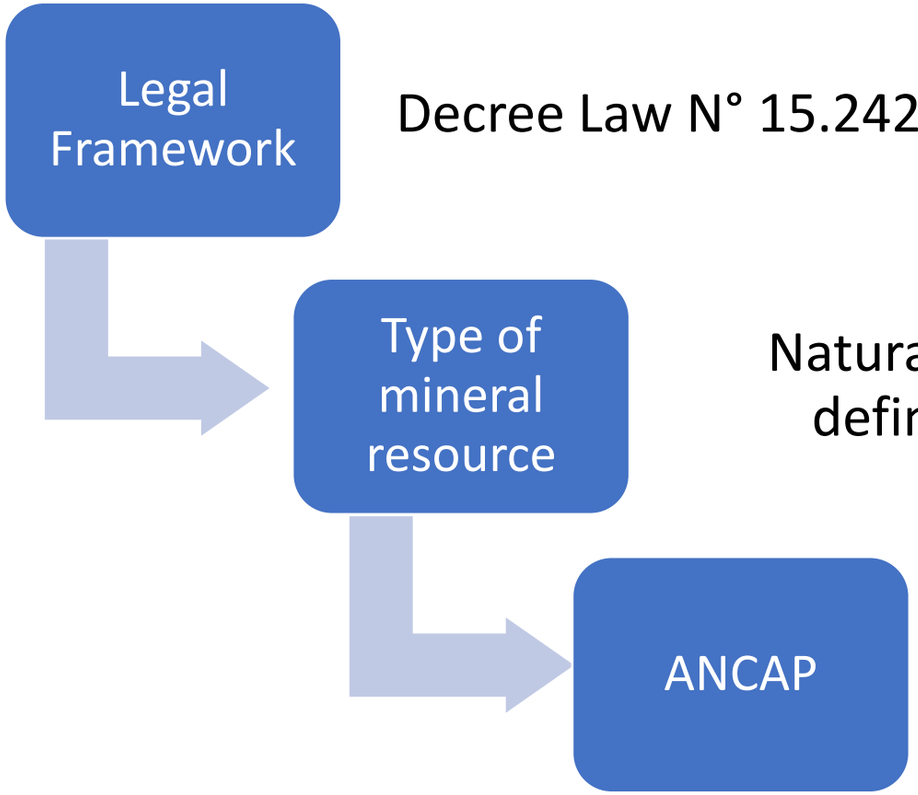
Legal Framework and Business Model

Legal framework



Decree Law N° 15.242/1982 (Mining Code).

Natural Hydrogen agree with Class I resources' definition (Article 7).

Only ANCAP, directly or through third parties, can explore and produce Class I resources

Business model: key features

- ANCAP to regulate and promote exploration.
- Contribute to exploration with legacy data and knowledge.
- Exploration and production to be carried out by qualified companies.
- Risk and investment allocation into private sector.
- Exploration, production contracts + multiclient contracts.
- Contract model approved by the Uruguayan state (ministry, president).
- Competitive process for awarding areas and contracts.

Research and Technical Cooperation

ANCAP has approved a template for research and technical cooperation agreement with interested companies (do not allow exploration activities):

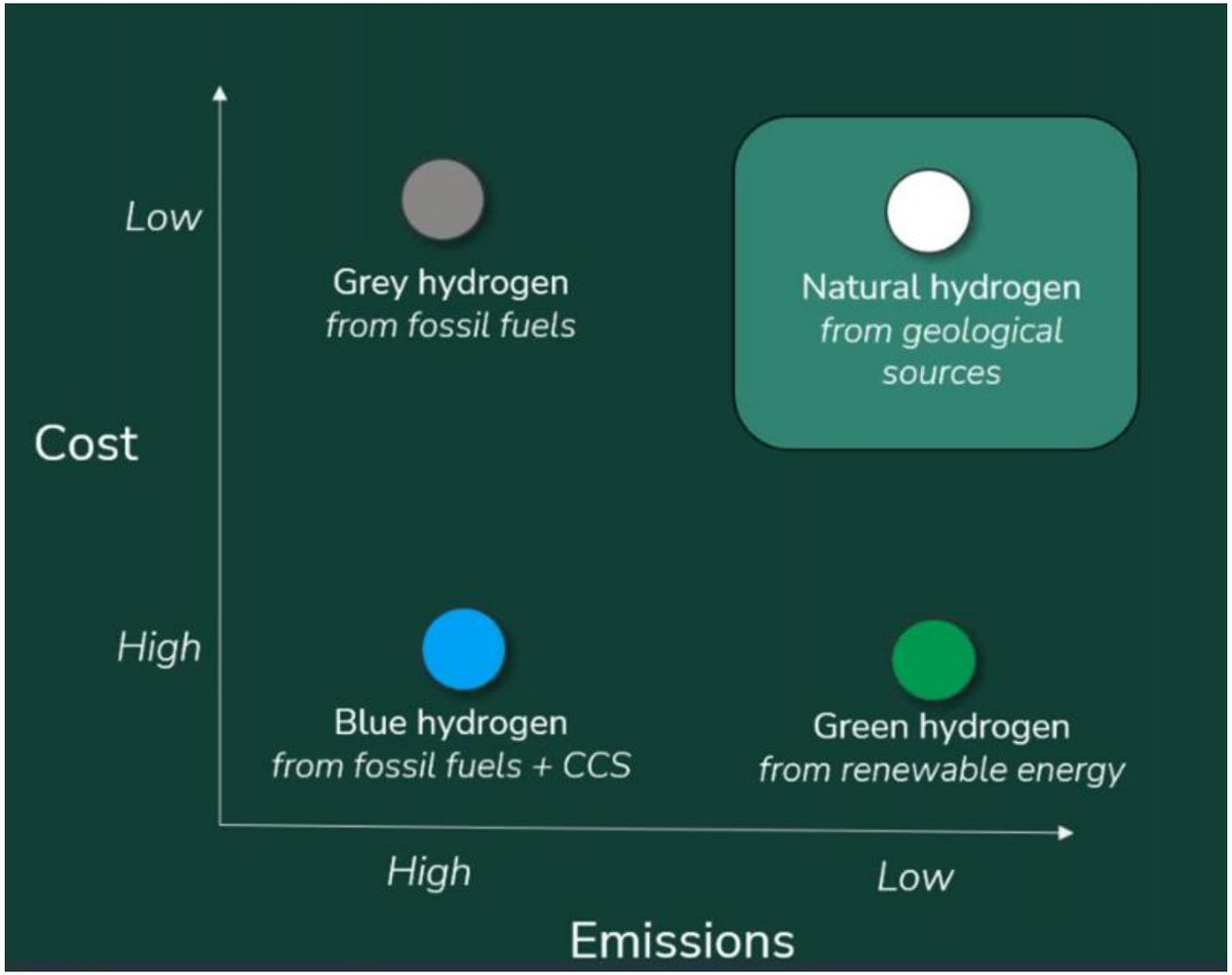
- Access to ANCAP database: legacy geological, geophysical and geochemical data, mainly but not exclusive from oil & gas exploration onshore Uruguay.
- Interested companies: explorers, service companies, research institutions.
- Exchange of expertise and data on natural hydrogen systems.
- Building local technical capacity and know-how.

→ Opportunity to understand natural hydrogen potential in Uruguay, in preparation for the competitive process.

Also contributing or participating in research projects with local and international universities and research institutions.

Roadmap

Motivation for Natural Hydrogen

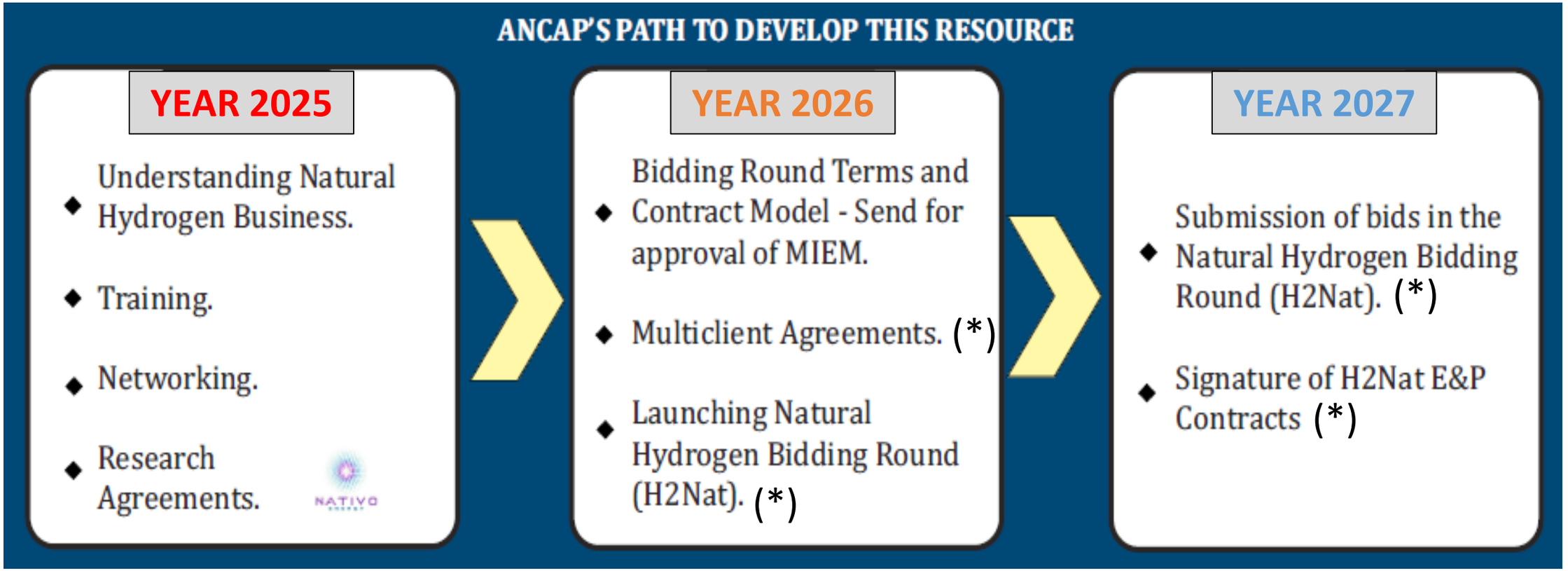


- Indigenous resource contributing to energy security and the creation of a local value chain.
- Potential low carbon footprint energy source, for hard to abate sectors (local and for export).
- Potential cost competitiveness.
- Synergies with green hydrogen (roadmap, renewable energy potential).

Looking Ahead: ANCAP vision for Natural Hydrogen

- To integrate with national energy transition strategy.
- To position Uruguay as a regional reference in natural hydrogen.
- Foster innovation, sustainability, and international collaboration.

Roadmap to Natural Hydrogen in Uruguay



(*) Multiclient agreements, bidding round terms, contract model and signature of contracts are subject to approval by the Ministry of Industry, Energy and Mining (MIEM)

Phase I: Knowledge & Capacity Building (currently)

2025

- Strengthen technical understanding of Natural Hydrogen systems.
- Training and capacity building.
- Overview of natural hydrogen potential with legacy data.
- Attend international events (technical & commercial).
- Market/ sector intelligence.
- Review of international regulations for exploration.
- Key features of the bidding terms and contract models.
- Promote research and cooperation agreements.

Phase II: Bidding Round (next step)

2026

- Continue training and capacity building.
- Finalize and submit bidding round terms and contract model.
- Review and approval process by the Executive Branch.
- Negotiation of multiclient agreements to contribute with information.
- Promote at international events and roadshows.

Phase III: Implementation

2027 …

- Bidding round launch.
- Bidding process: qualification of companies, submission, evaluation and selection of bids, awarding and approval.
- Signature of contracts.
- …
- Execution of the exploration programs: multiclient & awarded companies

Bidding terms & contract model (draft)

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Qualification (draft)

- Only qualified companies can bid.
- Legal, Financial and Technical background.
- Qualification for different periods (exploration with or w/o drilling, production).

Competitive bidding round (draft)

- Onshore areas with natural hydrogen potential.
- Award criteria based on three (3) objective and simple parameters to bid:
  1. Exploration program (committed): committed desktop studies, geological, geophysical and geochemical surveys, drilling, licensing of information (multiclient), and others;
  2. Commercial: revenues for the Uruguayan State (apart from general income tax);
  3. % of association of ANCAP at production stage.
- Comparison of bids based on an equation and area/ contract awarded to highest score offer

Contracts features (draft)

- Based on E&P business and contract models' experience.
- Contractor assumes all risks, costs and responsibilities.
- Term: 30 years
  - Exploration: 10 or 9 years
  - 1st Exploration Period: Exploration Program
  - Exploitation: 25 years
- Revenues for the Uruguayan State: from Contractor's income for natural hydrogen and all byproducts.
- Contractor's rent subject to Income Tax (25%).
- ANCAP has the right to associate for development and production after a commercial discovery is declared.

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AGENDA

- Natural Hydrogen Prospectivity in Uruguay

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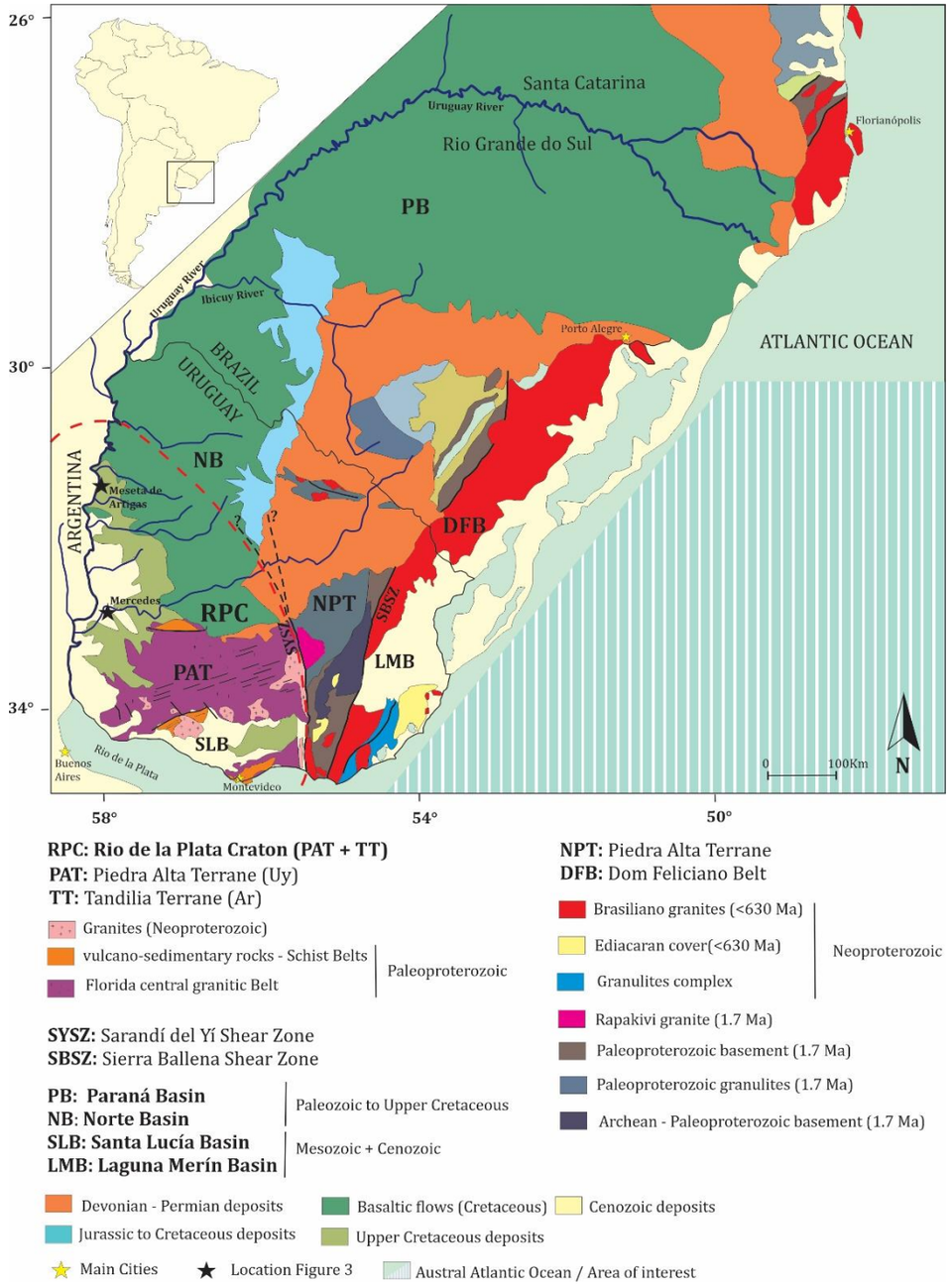
What do we have?

Many good rocks...

- 3 onshore basins
- Archean to Proterozoic basement with several rocks with potential for the generation of natural hydrogen
  - Paleoproterozoic BIFs and basaltic rocks outcropping
  - Indications of Mafic bodies in depth in two onshore basins
- Academic researchers are ongoing with interesting “pre results”



Prospectivity

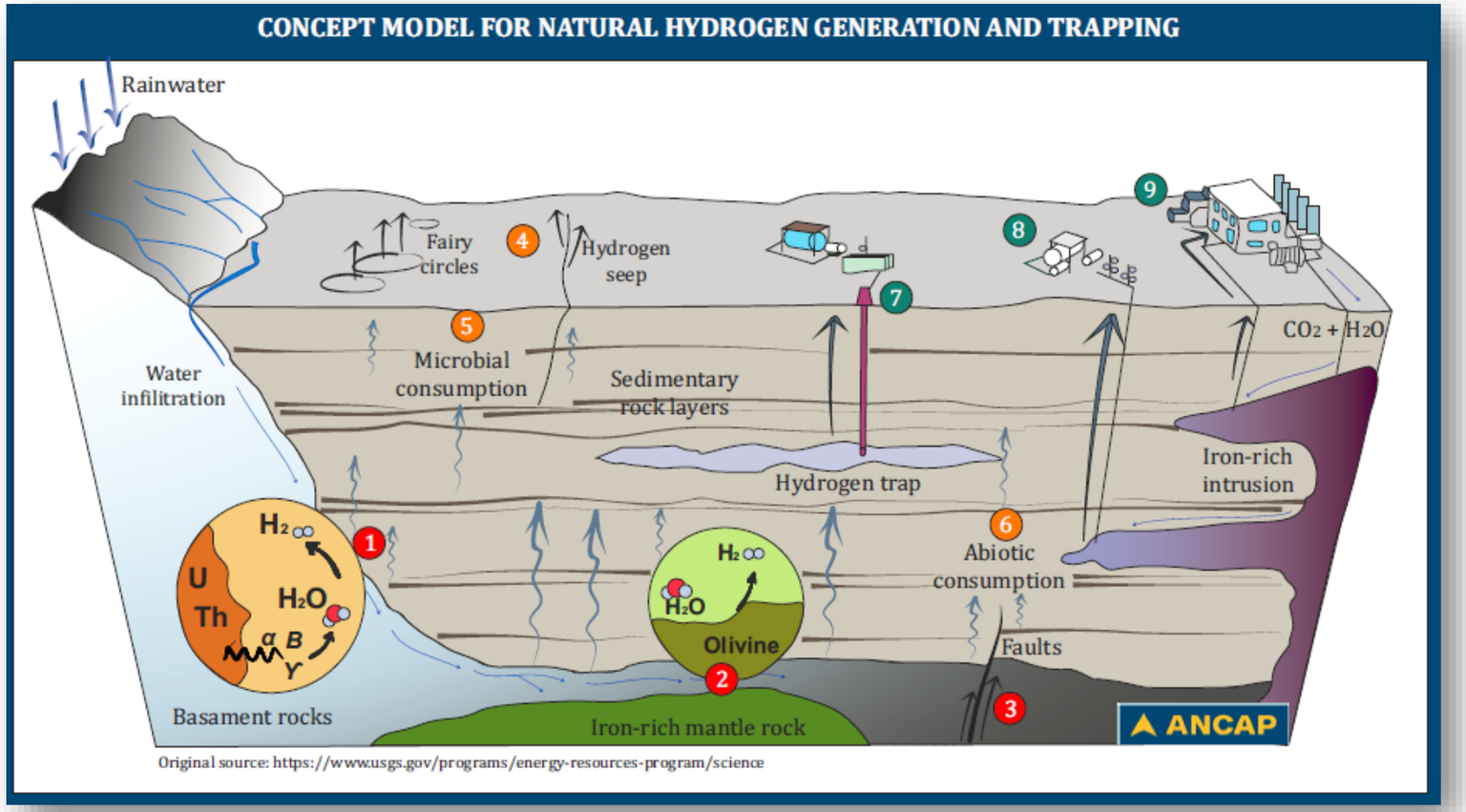
Conceptual Model for natural H_2 accumulation – USGS proposal

Ellis and Demas, (2023)

It is a gas that can accumulate in porous reservoirs just like hydrocarbons.

The conceptual model is like hydrocarbon exploration, where the following must be present:

- Source rock (basement rocks)
- Reservoir
- traps
- Seal



Main geological processes in Uruguay

I. **Oxidation processes:**
   a) Serpentinization: Oxidation of the ferromagnesian minerals: Fe_2+ in Olivines and Pyroxenes to Fe_3+ produces molecular hydrogen (H_2).
   b) Hematization: Oxidation of the BIF was Magnetite (Fe_3O_4) oxidized to Hematite (Fe_2O_3)

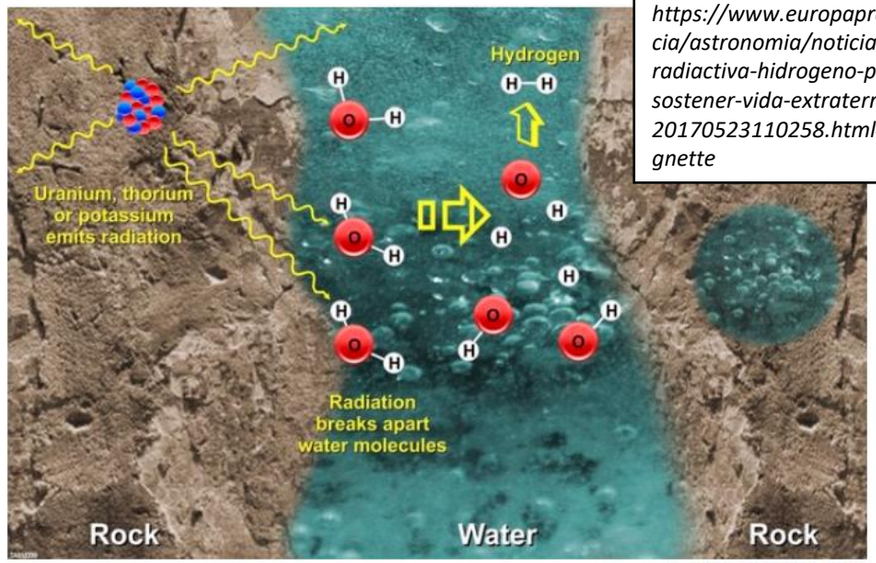
II. **Radiolysis:** The decay of radioactive minerals present in granites (uranium, thorium, and potassium) causes the splitting of water molecules contained within the rocks, releasing H_2.

Olivine (Mg,Fe)2Si2O4

Serpentinite

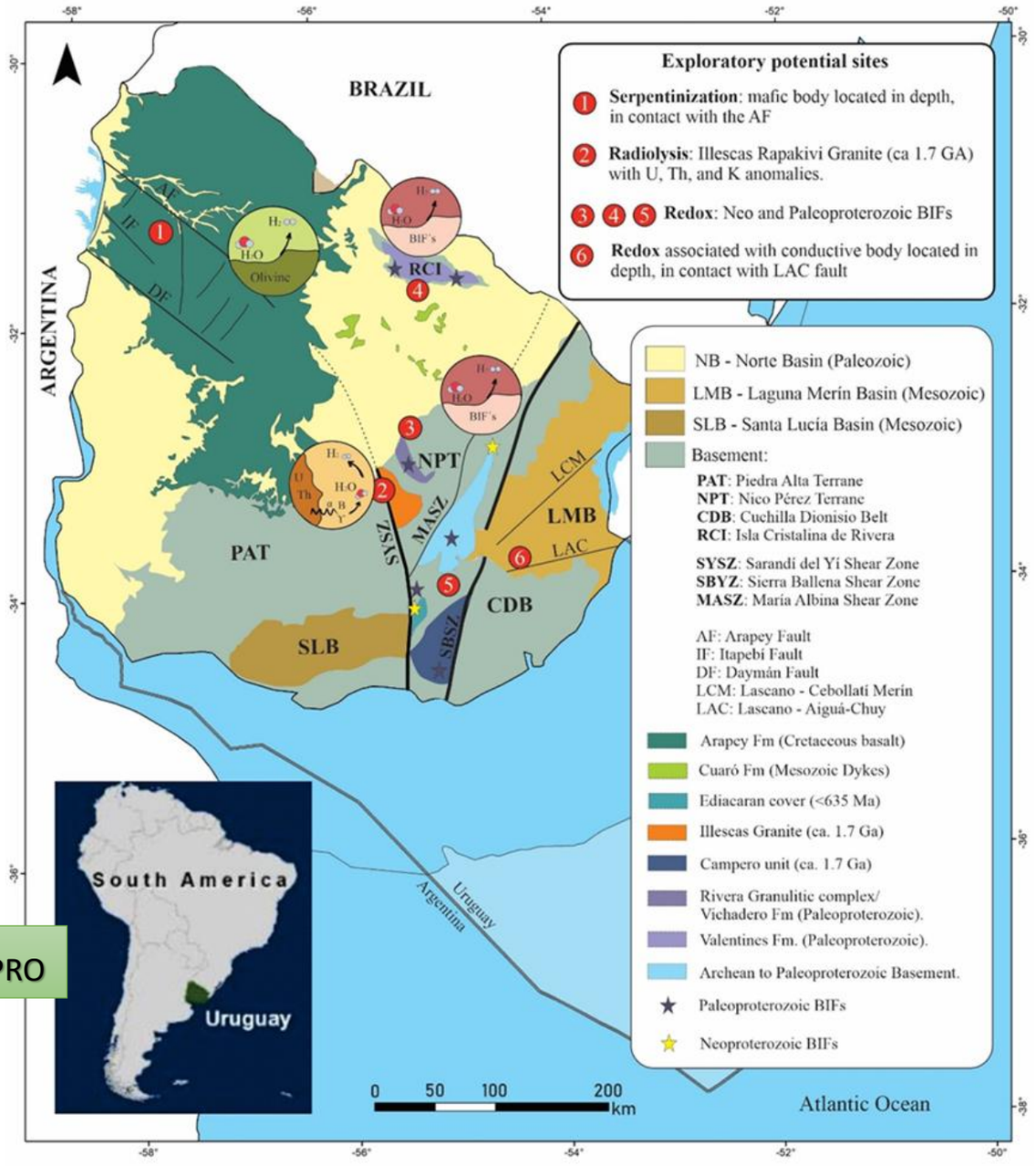
Minerals like olivine, orthopyroxene, spinel, altered by hydrothermal fluids, are replaced by minerals from the groups of the serpentine and the magnetite

https://www.europapress.es/ciencia/astronomia/noticia-sintesis-radiactiva-hidrogeno-puede-sostener-vida-extraterrestre-20170523110258.html#google_vignette



Geological Potential

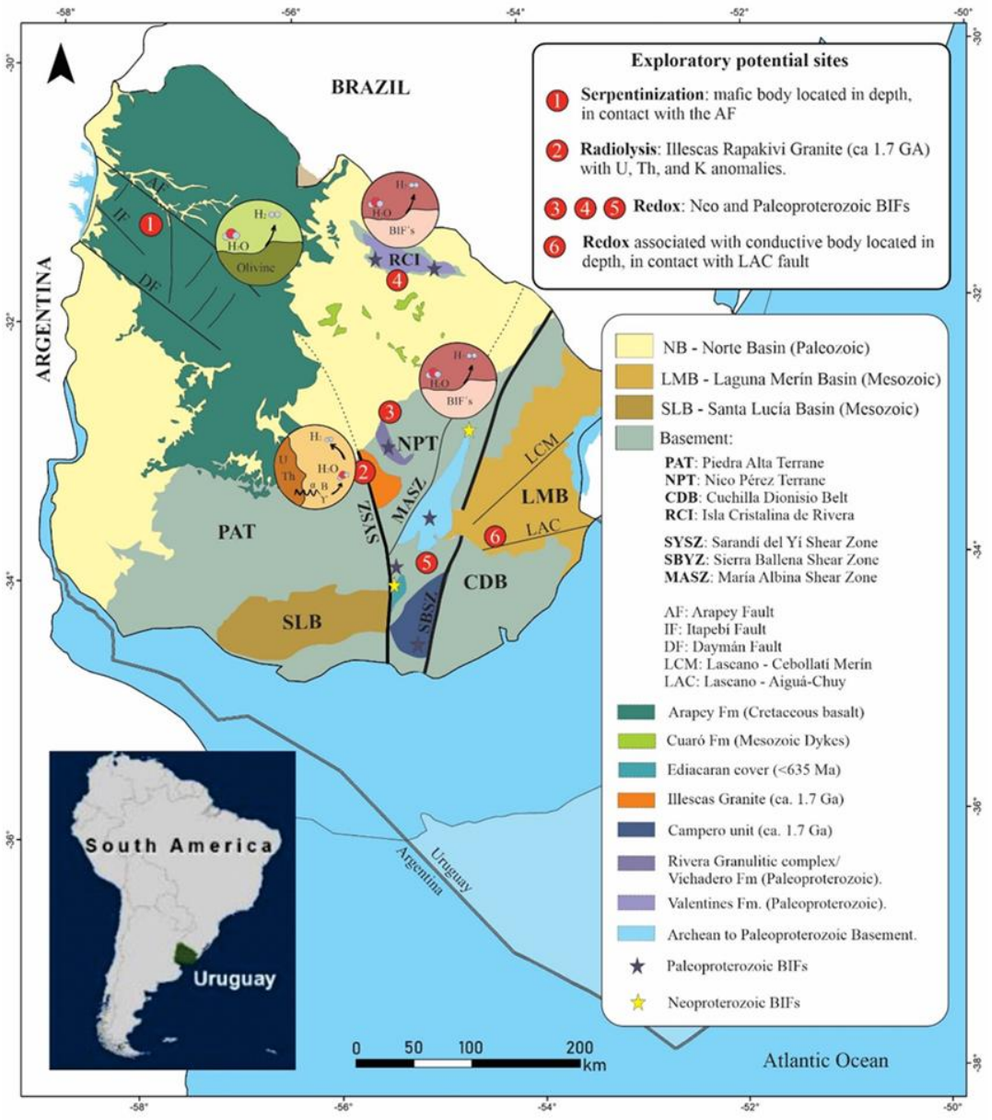
- **Preliminary geological potential** (serpentinization, oxidation of Fe-rich minerals, radiolysis.)
- Exploration is still at an early stage, but with solid geoscientific foundations.
- **Complementarity with other national energy** strategies (renewables, energy exports).



GeoExPRO

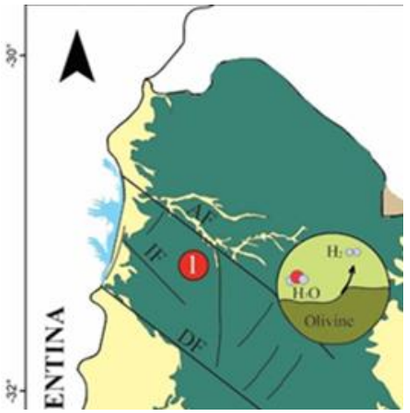
Map of sites proposed by ANCAP with potential for generations and possibles accumulatios [Marmisolle et al., (2025); modified from Sequeira et al., (2024); Oyhantçabal et al., (2018); and Oriolo et al., (2018)]

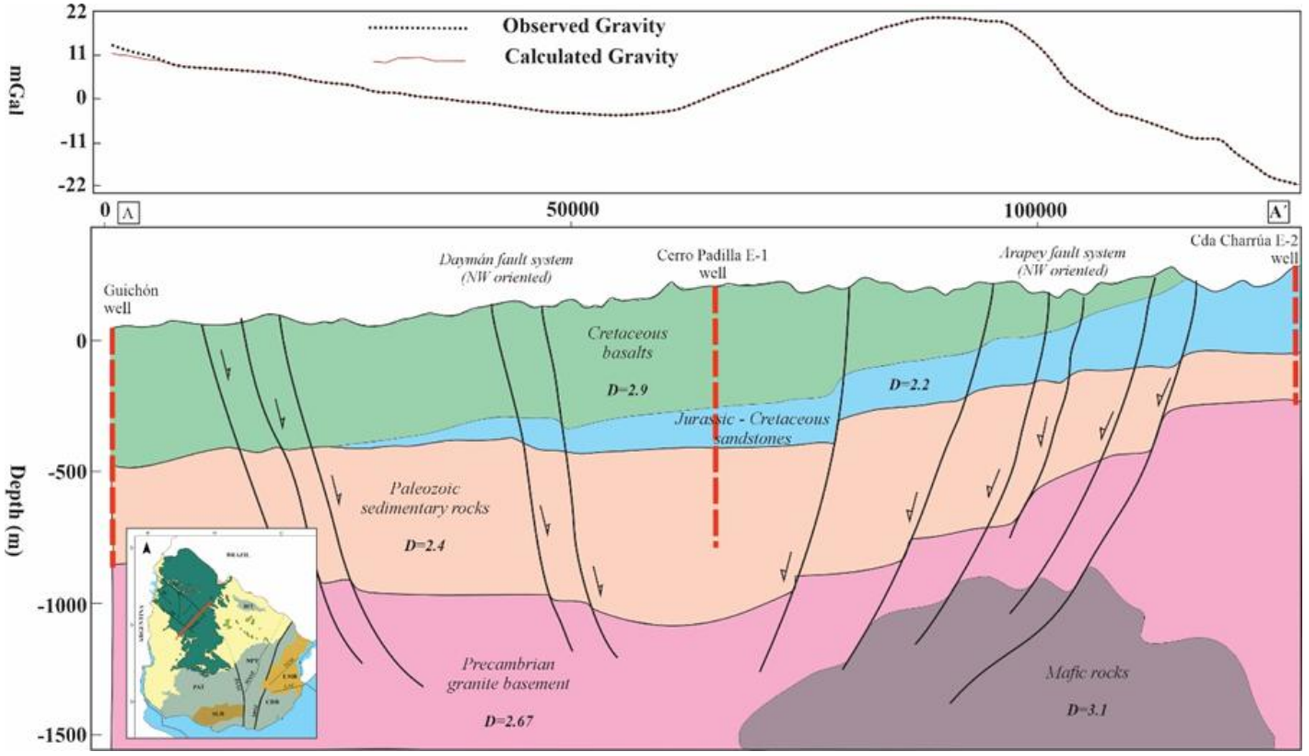
Geological Potential



Site 1:

- NW of Norte Basin
- Serpentinization of mafic body in depth
- Arapey system fault





Modificado de Rodriguez et al., (2015)

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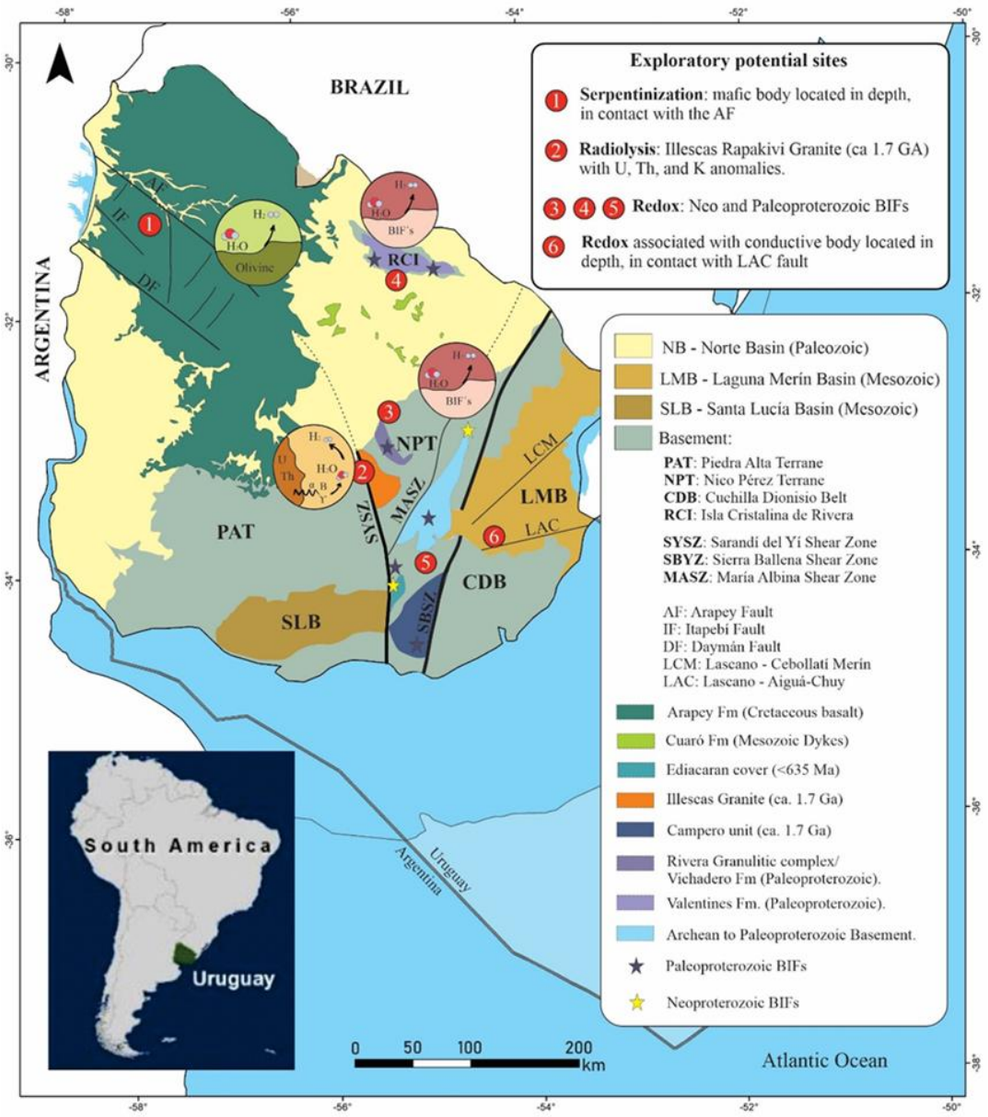
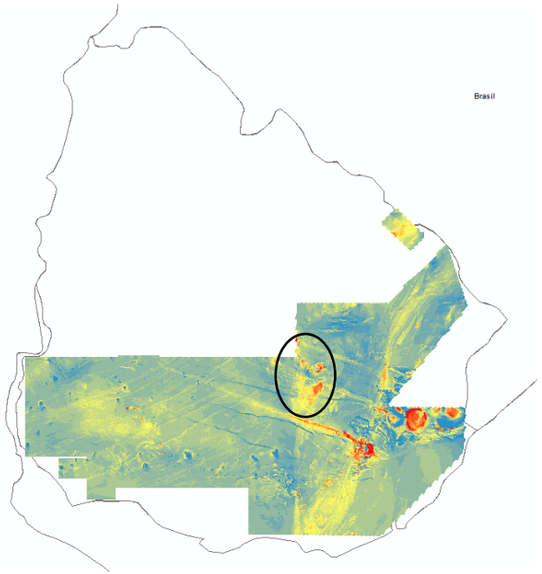
Geological Potential



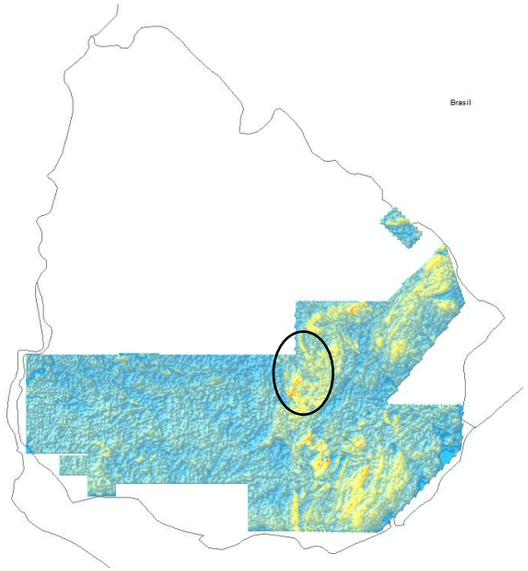
Site 2:

- Radiolysis from Illescas Granite
- Uranium and Torio anomalies
- Granite controlled by Sarandí del Yí Shear Zone

Aero-geophysical Survey: magnetic and gamma ray spectrometry.
Acquired by DINAMIGE (2015)

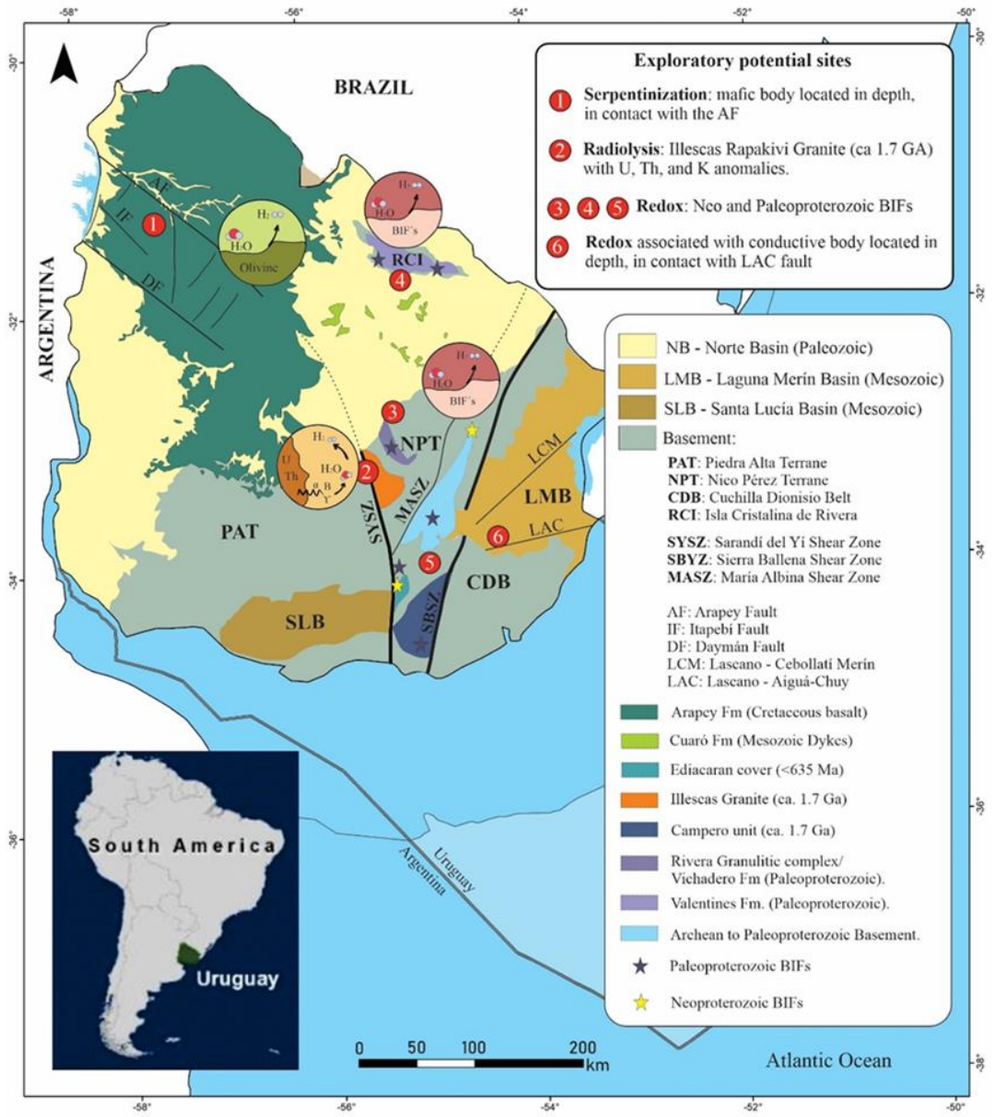


Magnetometric (Polo Reduction)
DINAMIGE, 2015



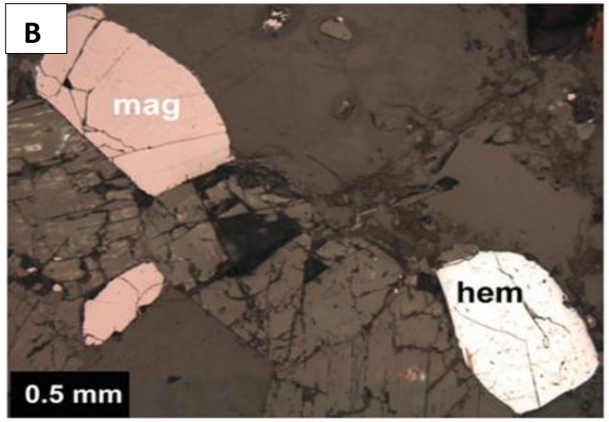
Radiometric anomaly.
DINAMIGE, 2015

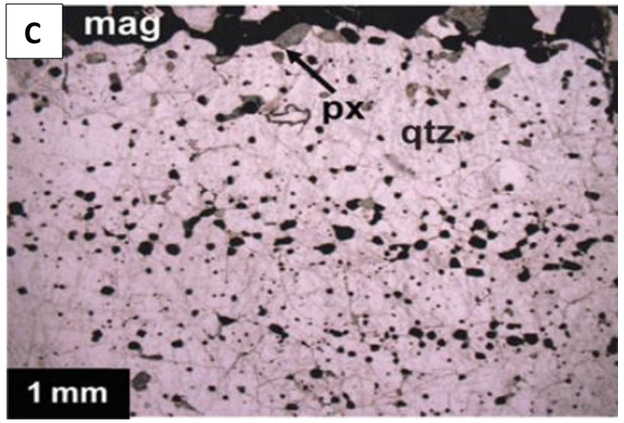
Geological Potential



Sites 3, 4 and 5:

- Oxidation of the Magnetite (to hematite) of the Paleo and Neoproterozoic BIF's
- Main BIFs: Vichadero y Valentines formations

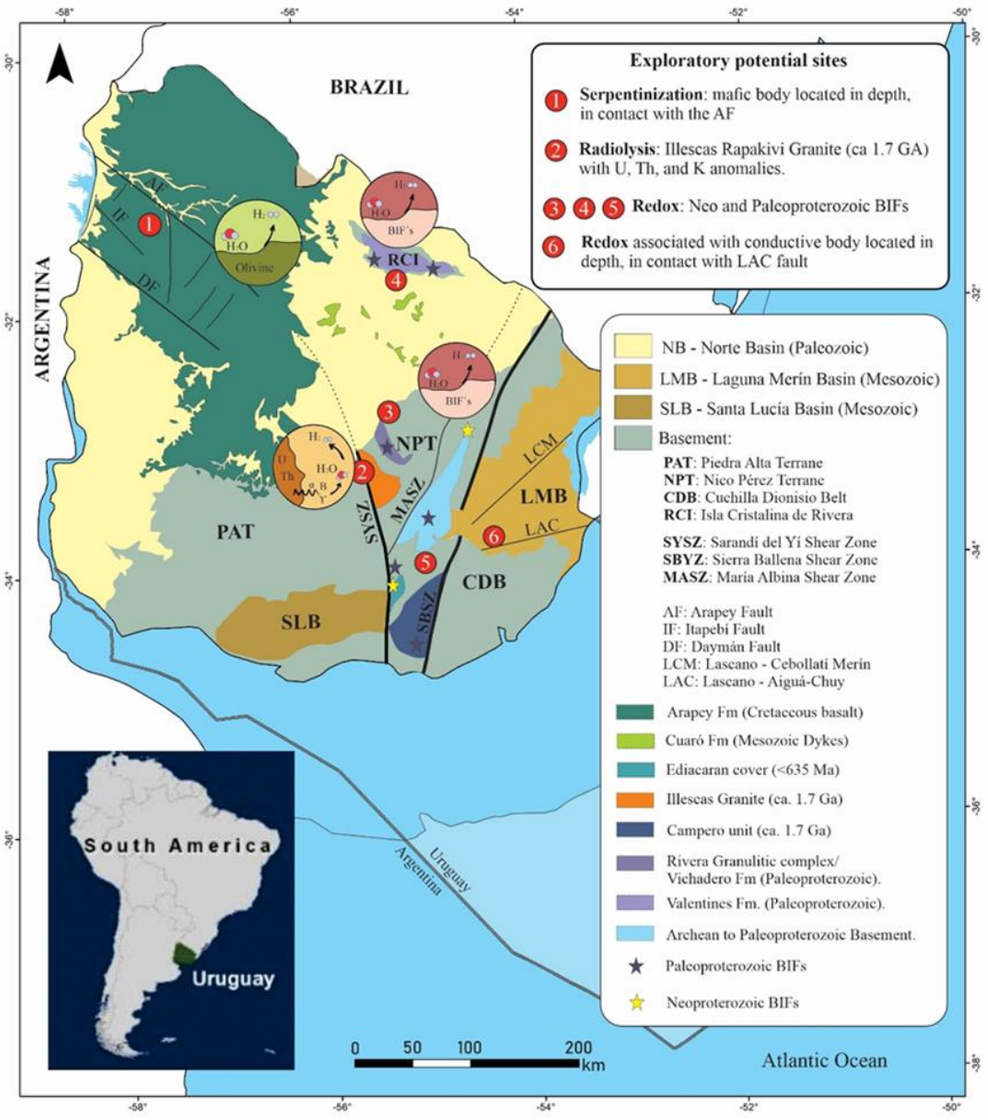


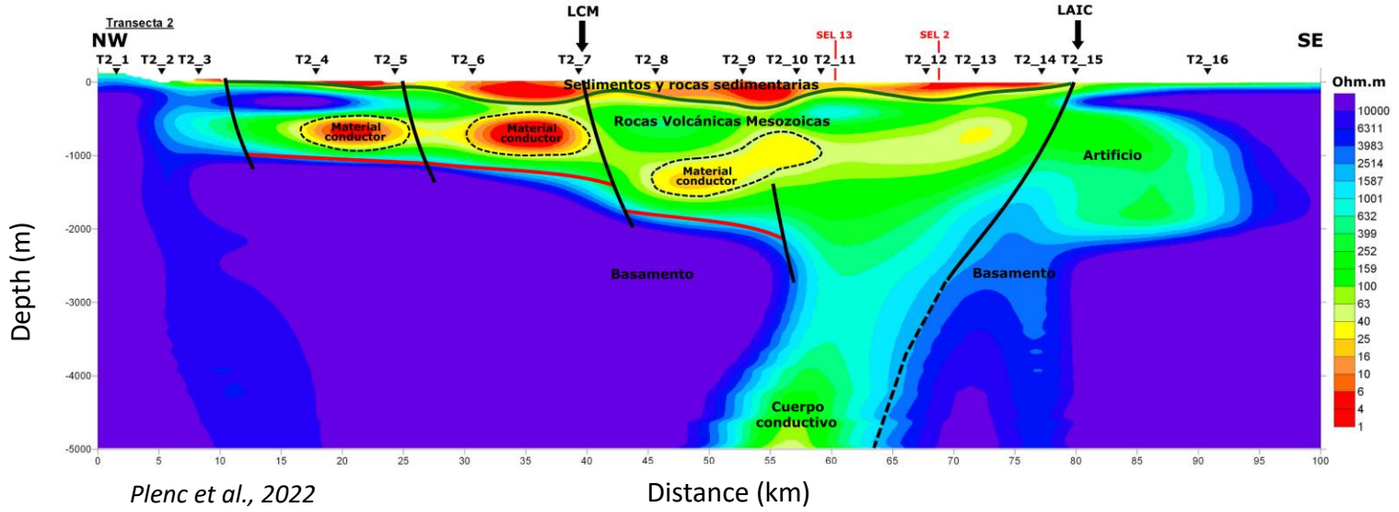


(A) Valentines Formation outcropping BIF;
(B) Magnetite (mag) replaced by hematite (hem);
(C) BIF showing layers mostly composed of qz, mag, and greenish clinopyroxene (cpx).

Source: Rosière et al., (2018).

Geological Potential





Plenc et al., 2022

Site 6:

- Conductive body (high content of Fe) located in depth (> 4000 m).
- H_2 generation associated with the oxidation process.
- Deep fault: LAIC ~Lascano–Aiguá–India Muerta–Chuy

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Database

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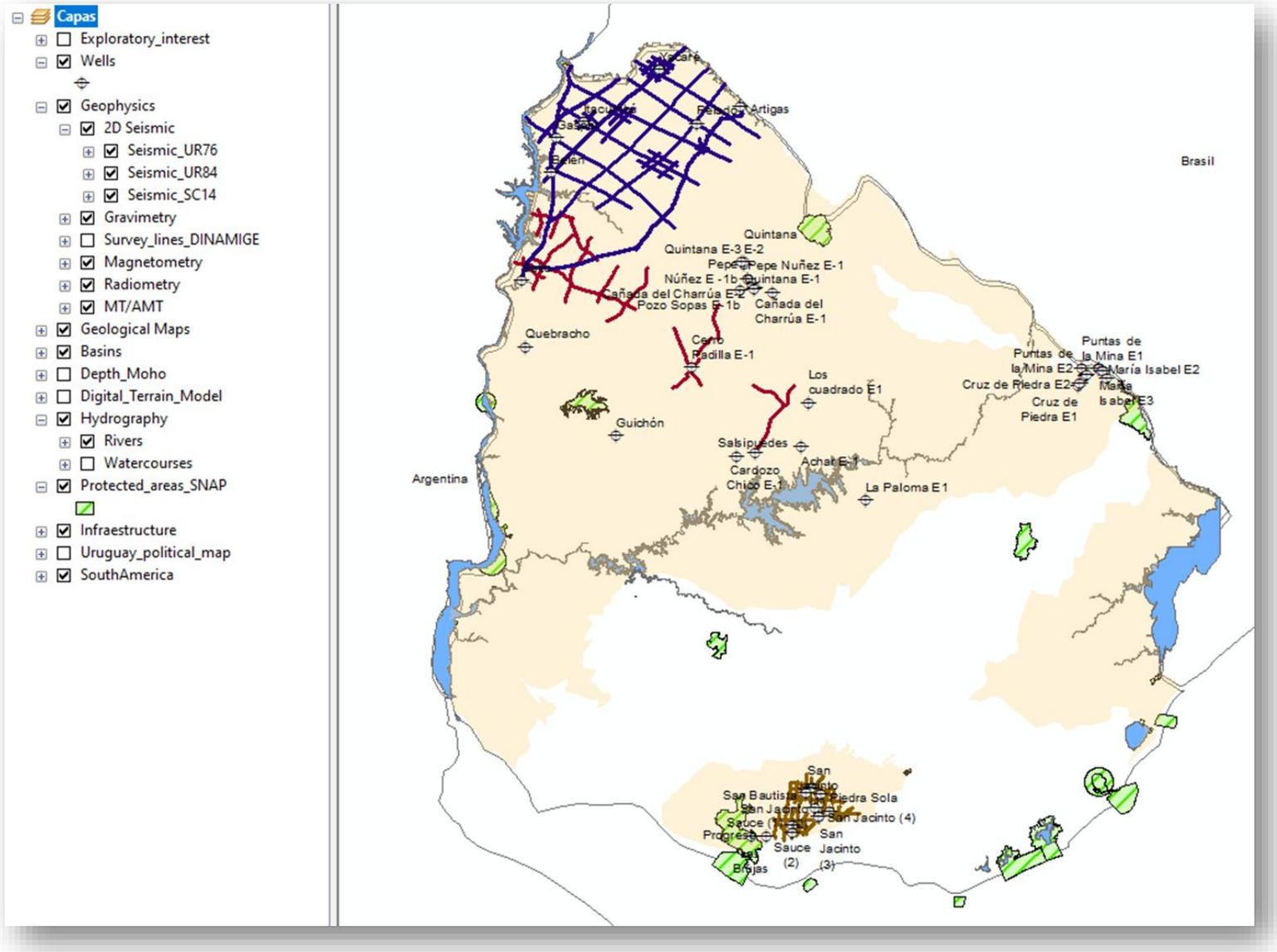
Natural Hydrogen Database

The database includes:

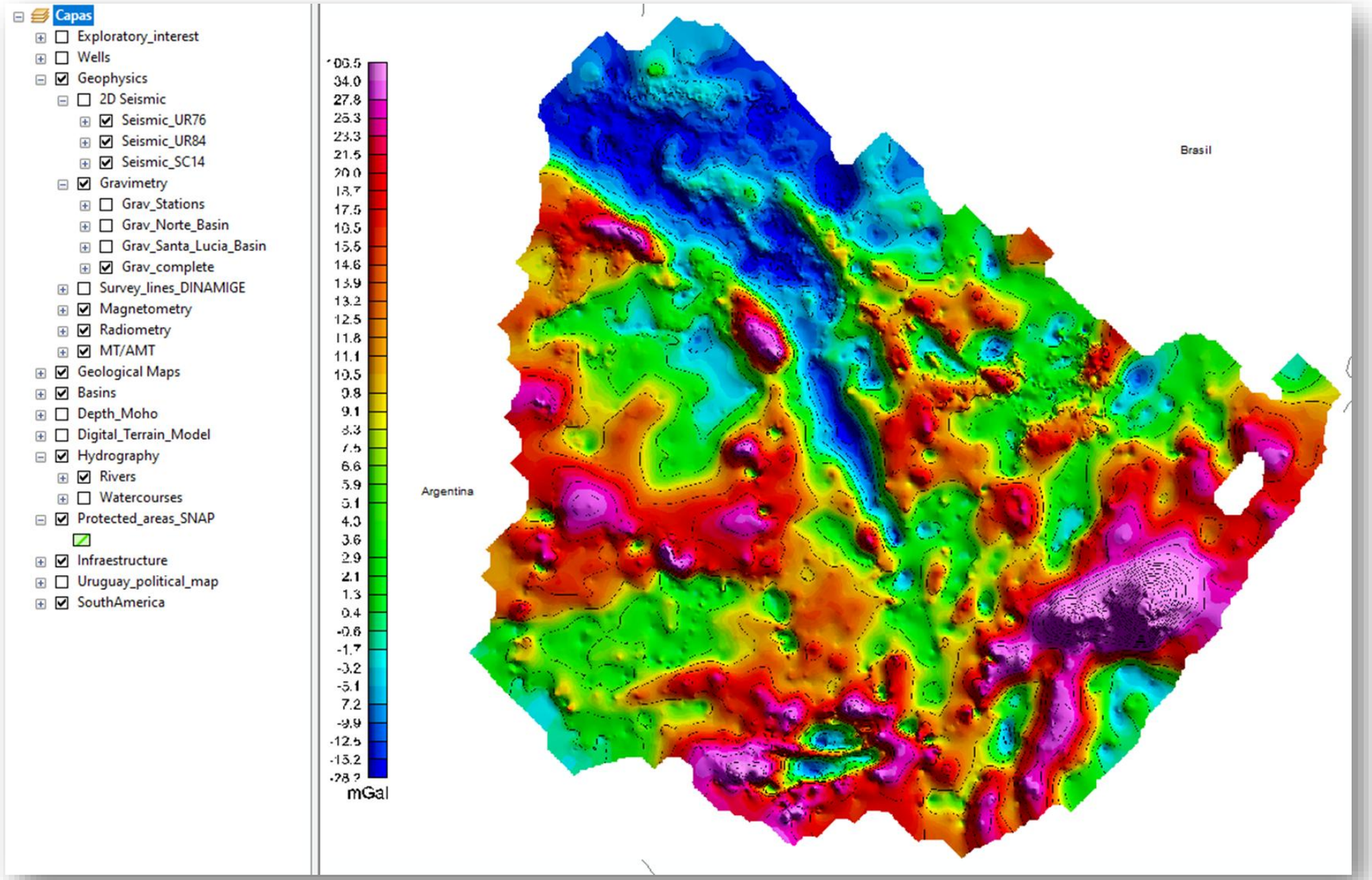
- Vintage 2D seismic (80s; NB and SLB).
- 2D seismic acquired in 2014 (NB)
- 12 exploration wells drilled in the 50s and 70s (NB and SLB
- 20 stratigraphic wells (NB).



Natural Hydrogen Database

The database includes:

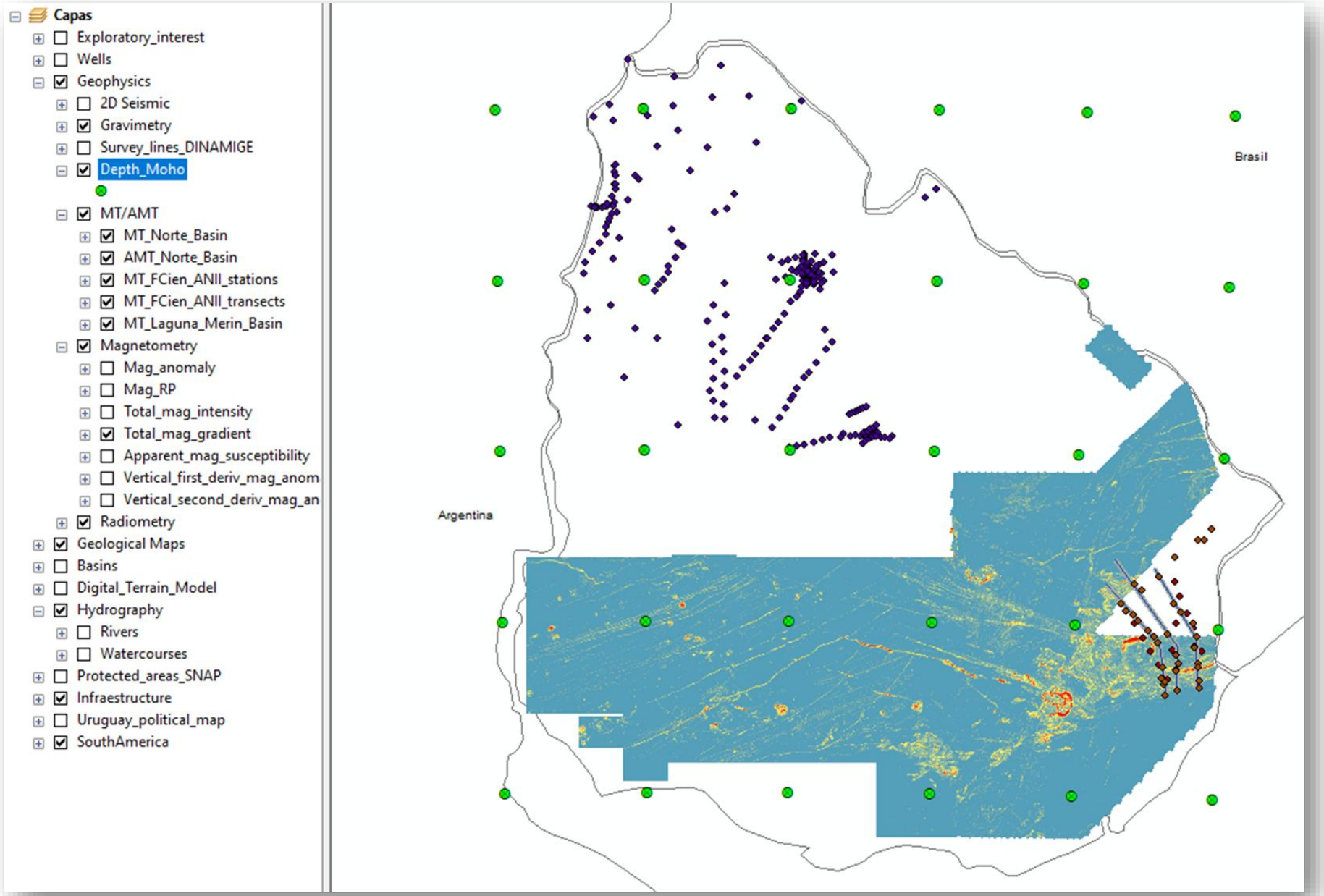
- Gravimetric data



Natural Hydrogen Database

The database includes:

- Radiometric data (public data)
- Magnetometric data (public data)
- Magneto-tellurian

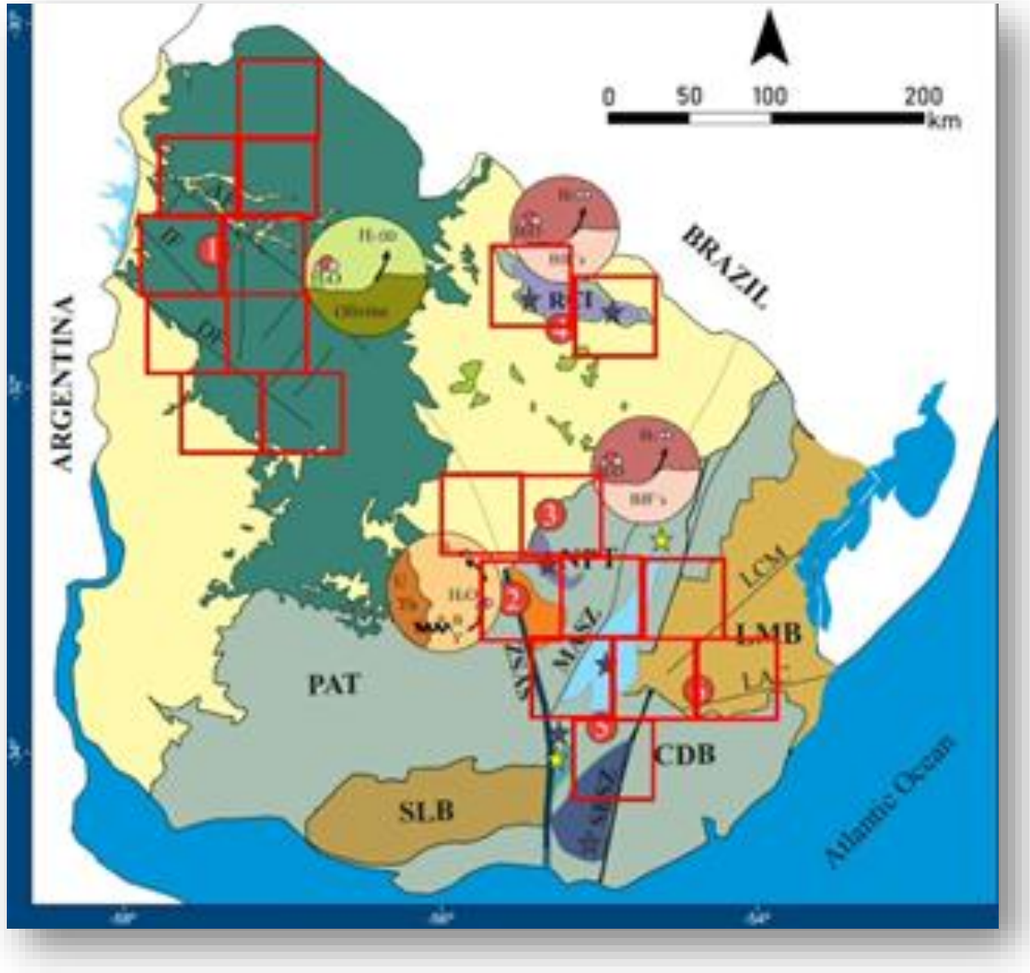


Next Steps

Looking ahead, our next steps include:

- Promote technical research agreements to facilitate knowledge exchange with interested companies.
- Collaborates with academic research projects.
- Validate the proposed geological model. This requires:
  - Apply analytical techniques to confirm the generation of hydrogen.
  - Subsequently, in a second study phase, assess potential accumulations to develop production models.

The collaboration with academics and companies will provide ANCAP with access to expert technicians, data, and valuable information.



Final Remarks

Key Takeaways

- Uruguay has made progress in the first phase of the energy transition, generating nearly all its electricity from renewable sources

- In this context, Uruguay has defined the roadmap for hydrogen as an energy carrier to help this decarbonization primarily, thus aiming to consolidate the industry of hydrogen and its derivatives in accordance with the strategy outlined up to 2040 (MIEM, 2023).

- Natural hydrogen is an emerging resource worldwide that could play a crucial role in the energy transition.

- The geological diversity of our country suggests that there may be potential for this resource. Meanwhile, initial academic research has begun, which will help to outline areas of interest.

- ANCAP, as a key player in this second energy transition, is moving forward in the evaluation of the potential of natural hydrogen, aiming at the generation of knowledge to eventually promote its future exploration and production.

MERCI BEAUCOUP!

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