

Il vettore idrogeno Stato dell'arte e potenzialità dell'industria italiana

*Milano, 1 marzo 2023
Fondazione Stelline – Milano*

Business Cases

Stefano Socci - ANIE

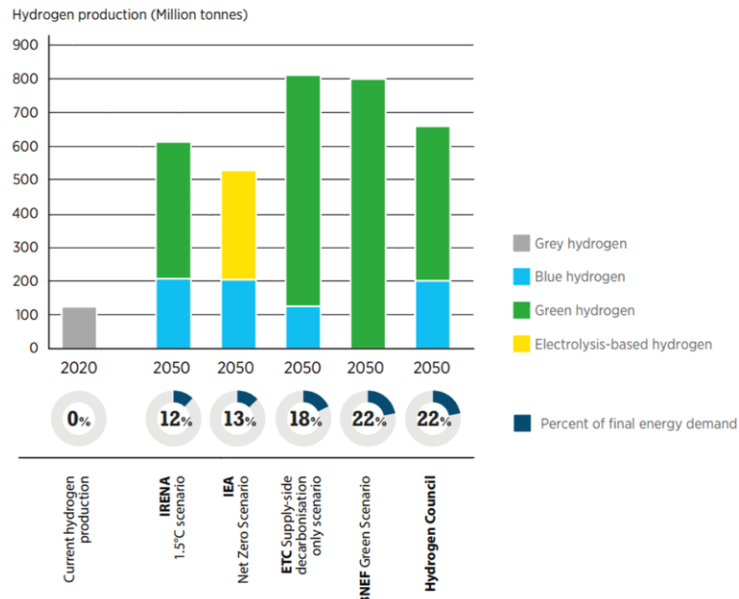
Renantis and Hydrogen



Renantis promotes and participates in different **nationals** and **internationals** initiatives for green hydrogen production.

Our **goal** is to develop a **complete proposal** within the energetic market throughout:

- PV and eolics power plant **optimization** with **hydrogen production**.
- **Strategic partnerships** with hydrogen end users.



Hybridization PV, Wind with hydrogen and BESS.



Combined uses of electricity and gas in the "hard to abate."

Decarbonization in the transport sector.

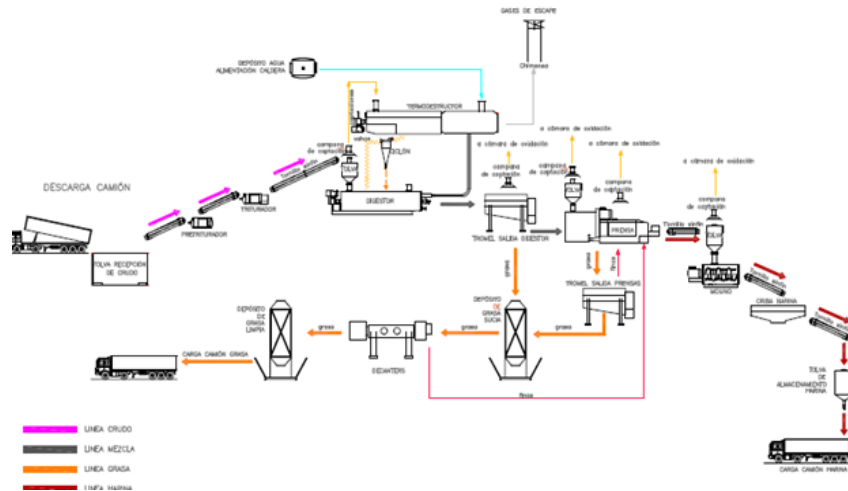
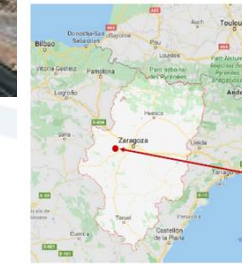
LIFE Cabezo Greed H2 Project



- ☐ Project number: LIFE20 CCM/ES/001694
- ☐ Project name: MW- Scale green hydrogen production plant to decarbonize the treatment of meat residuals in Spain
- ☐ Granting authority: European Climate, Infrastructure and Environment Executive Agency
- ☐ Project starting date: 01/07/2021
- ☐ Project end date: 31/12/2024
- ☐ Participants: ENAGAS RENOVABLE SL-FALCK RENEWABLES SPA-H2GREEM GLOBAL SOLUTIONS SL-RESIDUOS ARAGON SL
- ☐ Total ELEGIBLE PROJECT BUDGET(€): 4.561.956
- ☐ Total FINANCIAL CONTRIBUTION REQUESTED (€): 2.509.072
- ☐ Web Page: The Project - Life Cabezo (lifecabezogreenh2.eu)

Residuos Aragon

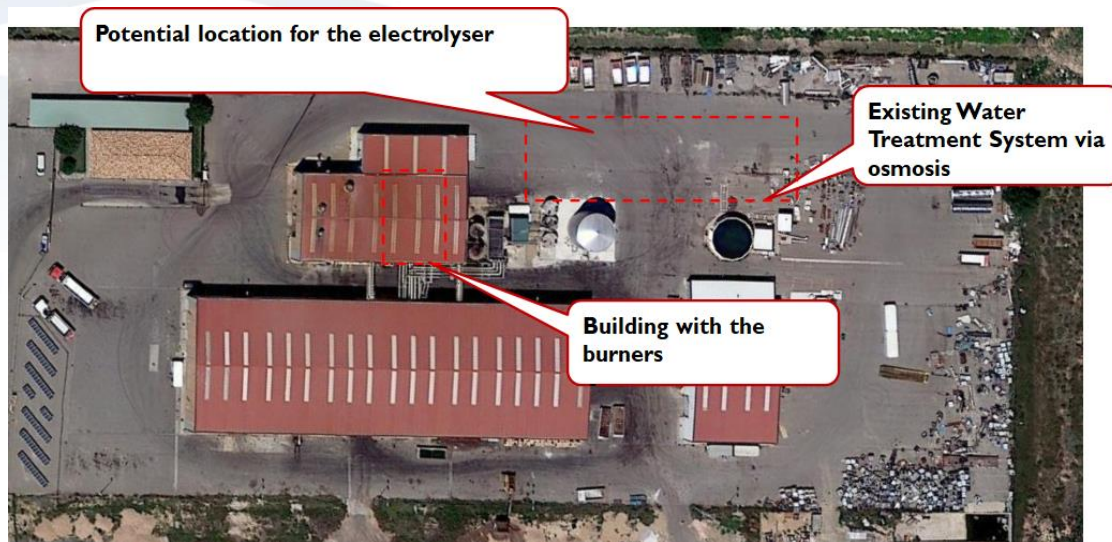
- ❑ **Residuos Aragon**, is one of the four Spanish companies focus on the **treatment and valorization of animal waste**, carrying out a process that includes all the **entire value chain**: collection, transportation, treatment, storage and transformation of these animal waste (Sandach) into value added products
- ❑ **Residuos Aragon** is located in Muel (Zaragoza)



- ❑ The installation is designed to **treat more than 70,000 tons of Sandach per year** with the possibility of extending the production facilities up to 210,000 tons per year.
- ❑ Innovative process, that results in the **transformation of this animal waste** that cannot be used as food. **into different sorts of fats/oil that** can be later used in other industrial processes. And also, it **generates biofuels** for the production of cement.

Project Objectives

- The **main objective** of the project is the **development of a green hydrogen production plant** in Muel (Zaragoza).
- The green hydrogen produced will be supplied to **Residuos Aragon** for the replacement of **at least a 20 vol-%** of natural gas used as a fuel in the process.
- This hydrogen plant will be **installed in Residuos Aragon site**, where there is more than **2000 m2 available** for the project.
- The **synergies** with **Residuos Aragon process**, such as, the **water treatment and other utilities**, will allow the project to **minimize the cost of the hydrogen** produced.

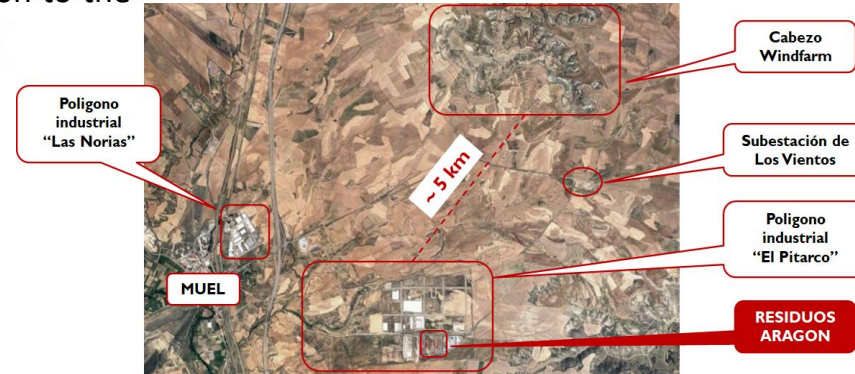


Project Objectives

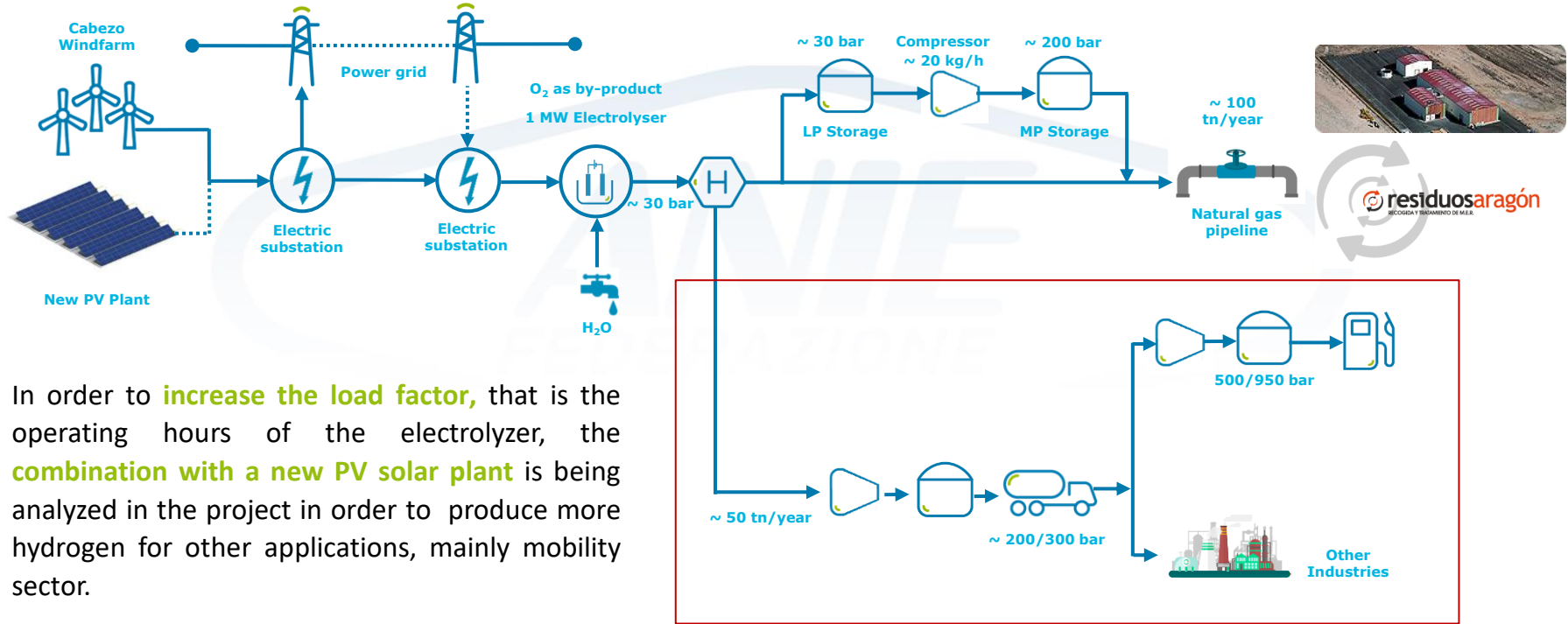
- For this purpose, a **1 MW PEM water electrolyzer** will be designed and developed in Spain by **H2GREEM company**.
- The electrolyser will be **connected directly to a windfarm** owned and operated by **Renantis** from 2003. The windfarm has a capacity of **23.3 MW** and is **located in Cabezo San Roque**, 5 km far away from Residuos Aragon.
- A **compressor and hydrogen storage system** will be integrated and optimised in order to adapt the intermittent hydrogen production to the continuous demand in **Residuos Aragon process**.
- The facility is expected to **produce more than 100 tonnes of green H2 per year**, which will be integrated directly in the **Residuos Aragon**.
- Besides of this, this plant **will produce high quality oxygen (approximately 800 tonnes per year)** that could be consumed by industrial companies located around the site.



Cabezo San Roque
23,25 MW
NEG Micon NM750-48
750
55m
48m
Muel (Zaragoza - Spain)
SET Los Vientos
15/12/2003
10/02/2004
Vestas



Project Objectives



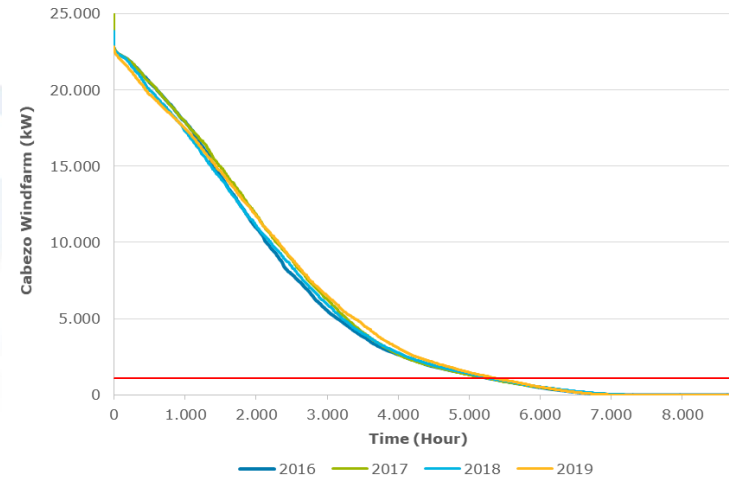
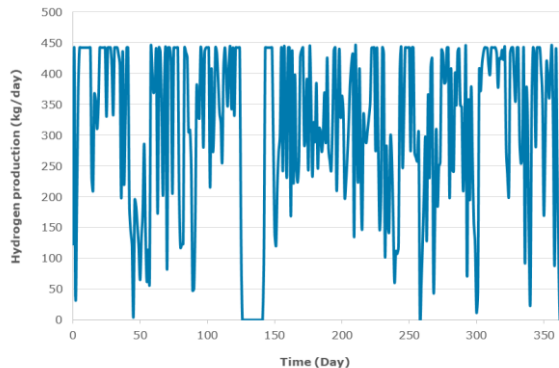
In order to **increase the load factor**, that is the operating hours of the electrolyzer, the **combination with a new PV solar plant** is being analyzed in the project in order to produce more hydrogen for other applications, mainly mobility sector.

Project Objectives

- Factor load ~ **6.794 hours**
- Hydrogen plant power consumption: **7.010 MWh/year**
 - From Cabezo Windfarm: 6.894 MW/year
 - From Grid: 116 MWh/year

The network supplies electricity only to the auxiliary systems when it is necessary (Grid power connection: 50 kW)

- Hydrogen production: **112 t/year (year 1)**



Due to the difference between Cabezo Windfarm (23.3 MW) power and electrolyser power (1,1 MW), electrolyser **could operate 5.373 hours** at 100 % load and **1.421 hours** at lower load.

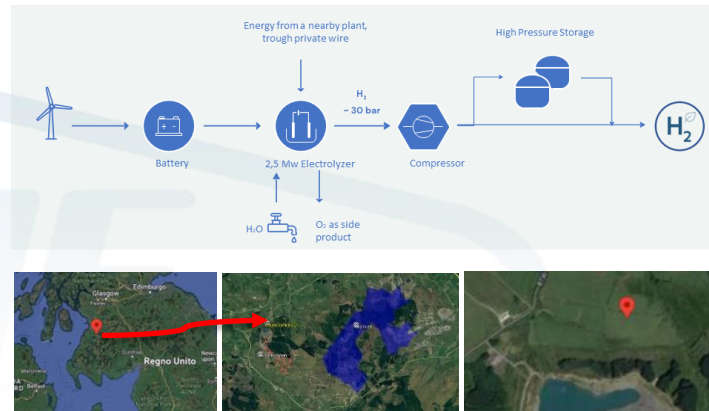
Knockshinnoch Green Hydrogen Project

PROJECT OVERVIEW

- Renantis has applied to a UK Gov funding program called “Net Zero Hydrogen Fund – Strand 2 – Capital Expenditure” for 30% of Hydrogen (H₂) CapEx for a Flagship Community Hydrogen project, using refurbished turbines (improving sustainability) and which will have a private cable importing green electricity from a nearby project under development.
- Average yearly H₂ production is 300 tons per year.
- H₂ sold as green fuel for road transportation
- Wind farm already consented but not built since there is not grid connection
- Two parties also involved as project partners: Logan Energy, responsible for compression & storage of hydrogen & HIVE Hydrogen, co-ordinating KGH2P engagement with the final hydrogen offtakers.

KEY CONSIDERATIONS

- Offtake letters of interest secured from a selection of sector players, to procure more than what we are able to produce.
- The duration of the market contracts are currently expected to be in the range of 3 – 7 years and with possibility that this will evolve as further demand comes on the market
- Renewable Transport Fuel Obligation (RTFO) requires green hydrogen, which would be eligible to receive 9.16 x the value of the dRTFCs (development Renewable Transport Fuel Certificate) for each kg of green H₂. dRTFC is worth ~£0.8/kg (£7.328/kg of H₂).
- Community: deploying our industry leading co-operative investment instrument to allow community to invest in the project and meet Scottish & UK goals for shared ownership.





Knockshinnoch Green Hydrogen Project

THE MARKET OPPORTUNITY

- UK Government goal for hydrogen is 10 GW by 2030 while Scotland's has a target of 5 GW by 2030 or equivalent of 15% of Scotland's energy needs by 2030 & 25 GW by 2045.
- UK's H2 strategy has focussed on development of GW-scale centralised production around the country's industrial heartland. To decarbonise sectors such as local transport, an additional network of low-carbon hydrogen 'hubs' will be required, which is what this project seeks to be a part of.
- These regional hubs will enable local production and use of low-carbon hydrogen, geographically widening low-carbon technology deployment and the associated supply chains, thus reducing overall sector risk.
- UK Government's goal for a zero-emission bus fleet by 2035 is supported by strategies which are increasing the deployment and penetration of hydrogen buses across the UK. Similarly, new trucks will be ZE by 2040. As an example, KGH2P will produce 340 t/y of H2 - enough to supply ~40 buses/y. 500 new H2 buses expected to be on order for deployment by the end of this year - with that number to grow exponentially

THE PROJECT SIGNIFICANCE

- KGH2P will showcase, how off-grid hydrogen production can be achieved technically and economically. The same configuration will be used for bigger project like the offshore projects both in Scotland and Italy.
- We foresee the replicability of such hubs in the UK before the end of the decade. They will enable retention of wealth in local communities, provide long term skilled jobs in rural and remote areas, help deliver lower hydrogen costs, where fuel costs have been traditionally high.
- Hydrogen production is an alternative route to market to avoid grid connection problems (for both onshore and offshore application) and would increase the opportunity to develop projects that are currently on hold for grid issues.
- We are planning to propose a new use of the community benefits from our operational plants to get communities to work with local Councils to consider to co-fund local hydrogen buses or trucks that would purchase hydrogen from our plant.

ScotWind Leasing - the H₂ as Innovative Factor

Crown Estate Scotland (CES), through **ScotWind Leasing**, will grant property rights for seabed in Scottish waters for new commercial scale offshore wind project development.

Sites were awarded based on ability to deliver **large scale offshore** projects by demonstrating capability and experience across multiple disciplines. **Innovation** was looked upon favourably within the bids.

We were bidding on the maximum allowance of 5 sites. All are for **floating wind**.

On 17 January 2022, we were awarded 3 sites:

- 1  **Bellrock**
1.2 GW
 - 2  **STROMAR**
1 GW
 - 3  **Broadshore**
500 MW
- BlueFloat ENERGY
- Orsted
- BlueFloat ENERGY



Opportunities for Hydrogen

ScotWind is proof that incorporation of hydrogen has the **potential to improve** our bids **and provide opportunities to expand** into other core areas.

Innovation was looked upon favorably within the bids

Partnered with an established Scottish developer. We have a commitment to investigate the potential for developing green hydrogen and/or ammonia plants.

Direct wire connections or PPA arrangements

Possible scenarios

- 100-500 MW electrolyzers
- Hydrogen produced and merged into existing gas pipelines
- Ammonia produced from hydrogen and shipped via deepwater ports in Orkney



Offshore Italy and hydrogen

Installed capacity: 5.5 GW

Expected production: 17 TWh/year

CO2 saved: 11 million TON/year

Green hydrogen potential: 400 thousand TON/year

Total investment: € 16 billion

Employment potential: 50,000 direct and indirect jobs



Tibula Enerqia
PARCO EOLICO MARINO

Nora Enerqia 1
PARCO EOLICO MARINO

Nora Enerqia 2
PARCO EOLICO MARINO

Kailia Enerqia
PARCO EOLICO MARINO

Odra Enerqia
PARCO EOLICO MARINO

Minervia Enerqia
PARCO EOLICO MARINO