

# **Projects in Spain** SolWinHy Cádiz, SolarHy Córdoba & Bolson Linares

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Viridi RE & Green Enesys

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## About the project developers



Viridi RE and Green Enesys



**15-year** success story in the field of renewable energy



Many years of experience in the development and construction of outdoor **PV systems** 



Together, the two companies have developed, financed and partially built over **500 MWp** of PV projects over the past 10 years



Experience in the field of **hydrogen-based** technologies



Current project pipeline: 2.2 GWp of PV projects in Spain and approximately 7 GWp worldwide.



Headquarters in **Germany**; Offices in **Spain**, **Italy** and **Switzerland** 

### Context



### German and EU hydrogen strategies

- **Strategic role of hydrogen.** To meet the climate target of full decarbonisation by 2050 hydrogen needs to be produced with renewable energy (green hydrogen).
- Germany: 10 GW by 2030 (KoaV), Hydrogen Strategies foresees demand of up to 110 TWh/year → up to 70% of hydrogen must be imported.
- EU target raised from 10 million t to 20 million t of green hydrogen in 2030 (Hydrogen Accelerator presented 8 March).
- EU Member States in the South of Europe offer opportunities for cost-efficient production of hydrogen due a combination of stable framework conditions and excellent solar conditions ("hydrogen clusters").
- Lack of enough renewable resources in South of Germany to cover its needs
- Transport of hydrogen is a challenge.

### **Why Methanol**



# The choice for methanol was made based on a mix of **strategic and practical considerations:**

- Methanol can be used in a variety of applications: As a basis for producing lowcarbon fuel (blending / synthetic fuel) or as feedstock for other products, including in the chemical industry
- Methanol has a high density of hydrogen per each carbon unit
- Production of methanol cost efficient also for low synthesis rates

### **Development projects**





### SolWinHy Cádiz

The project aims at producing yearly from end 2025

- 5 700 tons of hydrogen to be processed to
- **30 000 tons** of green methanol

### SolarHy Cordoba

The project aims at producing yearly from mid 2026

- 6 000 tons of hydrogen to be processed to
- **31 000 tons** of green methanol

### **Bolson Linares**

The project aims at producing yearly from mid 2027

- 8 000 tons of hydrogen to be processed to
- 44 000 tons of green methanol



# SolWinHy Cádiz

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Power generation & hydrogen production



PV plant: 126 MWp
Wind Farm: 60 MW
Location: Arcos de la Frontera
Electricity generation: 376 GWh/year

LCOE: 3,0 c/kWh (weighted average)



**Products:** The green hydrogen will be converted into 30 000 t/year of green e-methanol by combining H<sub>2</sub> with CO<sub>2</sub>

**CO<sub>2</sub>:** Biogenic CO<sub>2</sub> captured from a biomass power plant (liquified and transported)

**No grid connection:** hydrogen is generated exclusively from solar and wind power, no impact on the national grid



Hydrogen production: 5 700 t/year

Electrolyser: PEM 70 MW

**Oxygen:** As a by-product, 45 000 t of oxygen will be produced per year.

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Water ponds (Evaporation and Storage)

Water pipe from the Municipal WWTP (Waste Water Treatment Plant)

Process Plant

Wind Farm

PV Plant

Interconnection Line



Plant lay-out



### Plant lay-out

Water ponds

Process Plant

Wind Farm

PV Plant

Interconnection Line







General disposition -Process plant location



Hydrogen projects in Spain - Confidential



### Layout process area









### Weekly e-Methanol production



Weekly Methanol Production

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CAPEX	210.000.000

Yearly OPEX (without financial costs)					
0&M	4.250.000				
Consumables (CO2, water, etc)	3.250.000				
Levelized overhaul	1.250.000				
Transport	2.400.000				
Others	410.000				
TOTAL	11.560.000				

## **Project Economics**



## **Timeline & Financing**





 Financing (debt and equity) will be structured and organised by Viridi and Green Enesys.

## **Environmental Impacts and Carbon Footprint**



CO<sub>2</sub> and Water



### CO<sub>2</sub>

- CO<sub>2</sub> reduction > 70% (compared to fossil benchmark)
- Green methanol considered (RED II): "Renewable Fuel of Non-Biological Origin" (RFNBO)
- Estimated CO<sub>2</sub> savings per year: 95 000 t CO<sub>2</sub> /year

### Water consumption



- Water consumption: **110 000 t/year** (= average consumption of 1,500 people).
- Water will be supplied from a local Waste Water Treatment Plant.
- Water as by-product from methanol production will be used for production of  $H_2 \rightarrow 20\%$  water consumption saving
- A storage dam on-site is foreseen to stabilize water demand



# Transport, Off Take, Outlook & Partners

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### Transport



 Green methanol (liquid) will be transported from Arcos de la Frontera, Córdoba and Linares to Karlsruhe by train.

 Strategic location with a direct train connection with the rest of Europe and proximity to existing chemical complexes and ports.



- The requirements for rail transport was evaluated with DB Cargo BTT.
- A logistical concept was developed



 Proximity to the existing Spanish gas transmission system and the **future hydrogen transport** infrastructure.

### **Train Station hub in Córdoba**



### Córdoba



Methanol transported in electric trucks from all projects in Andalucía



### 5 wagons loading



## **Off-Take**



ReFuels Baden-Württemberg



- The Ministry of Transport of Baden-Württemberg supports the project in the context of the project "reFuels – Rethinking Fuels".
- The reFuels project plans to establish a pilot project for the production of green e-fuels at a refinery in Baden Württemberg. Annual production of re-fuels 50 000 t/year
- Intention to scale up the production of green e-Fuels to 500 000 t/year (refuels RoadMap Baden Württemberg)

### **Partners**

**DB Cargo BTT:** transport by train to Germany

- Renfe
- Adif

## Main suppliers

**PV plant** 

• KACO new energy: inverters for the PV plant

Hydrogen generation:

• Siemens Energy: electrolyser

**Methanol production** 

BSE Methanol: technology to produce methanol

**Technological centers** 

- German Aerospace Centre (DLR)
- Fraunhofer IEG
- Universidad Politécnica de Madrid (UPM -ETSIN)





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**DB** Cargo









### **Projects pipeline**



Based on the development of the projects in Cadiz, Cordoba and Linares, we aim to scale up the green hydrogen project pipeline in Spain, reaching **2 GW** renewable power capacity by 2028

	COD	Electrolyzer (MW)	Renewables (MW)	Methanol production
SolWinHy Cádiz	2025	70	126 PV + 60 Wind	30.000 t/y
SolarHy Córdoba	2026	105	200 PV	31.000 t/y
Bolson Linares	2027	140	300 PV	44.000 t/y
SolarCemHy Toledo	2028	140	300 PV	44.000 t/y
SolEoHy CLM	2029	455	1000 PV + 200 Wind	200.000 t/y



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