



Methanol as a carbon neutral fuel

Progress in Spain

CONAMA 2022

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Methanol fuelled vessels

- **Proman and Stena Bulk** → construction of Stena Pro Patria 49,900 dwt methanol dual-fuel MR tankers → delivered by Q1 2022
- **Danaos Shipping** → deal with South Korea's Daehan Shipbuilding → construction of four 7,200 teu methanol vessels → delivery scheduled Q2 and Q3 of 2024
- **Esvagt & Ørsted** → world's first service operation vessel (SOV) that can operate on green fuels → delivery scheduled Q2 and Q3 of 2024



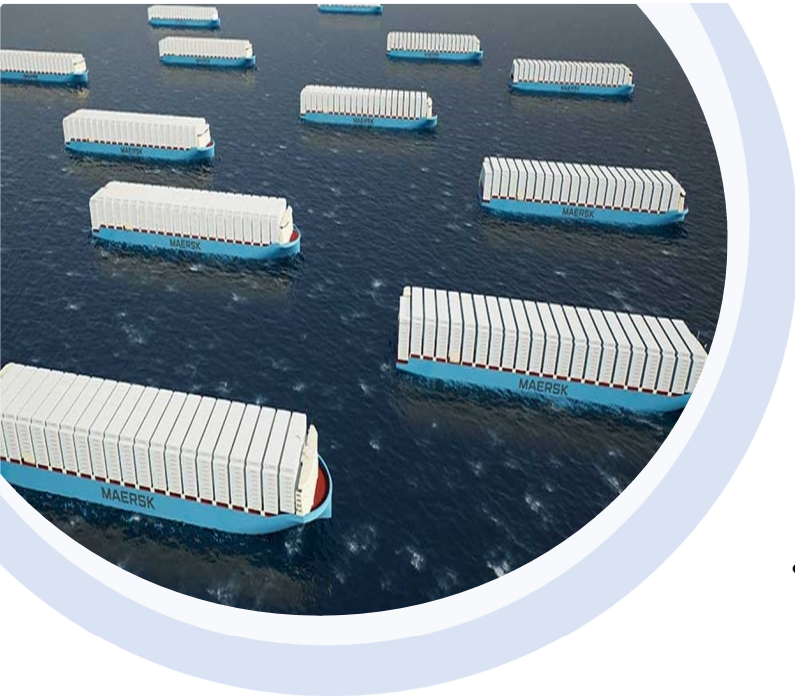
Methanol fuelled vessels



- **Acta Marine** → construction of two next generation dual-fuel methanol → perform maintenance tasks on completed wind farms → delivery in Q2 and Q3 of 2024
- **CMA CGM** → ordered 10 smaller LNG dual-fuelled ships and six 15,000 teu dual-fuel methanol-powered vessels → delivery in Q4 of 2025
- **ONE** → signed shipbuilding contracts with both Hyundai Heavy Industries and Nihon Shipyard to construct five 13,700 teu methanol vessels each → delivery in 2025

Methanol fuelled vessels

- **MAERSK** → strategic partnerships with six leading companies with the intent of sourcing at least 730,000 tonnes/year of green methanol → first 12 green container vessels → delivery in Q4 2025
 - The six companies are: CIMC ENRIC, European Energy, Green Technology Bank, Orsted, Proman, and WasteFuel
- **COSCO Shipping Energy Transportation** → ordered twelve methanol dual-fuel 24,000 teu containerships worth nearly \$2.9bn → delivery between Q3 2026 and Q3 2028



Projects in Spain

SolWinHy Cádiz, SolarHy Córdoba & Bolson Linares

Viridi RE & Green Enesys

[Image: Shutterstock]

About Viridi RE and Green Enesys



15-years of experience in the development and construction of **PV systems**. Additionally, over **500 MWp** of PV projects sold, **1.5 GWp** of sales signed.



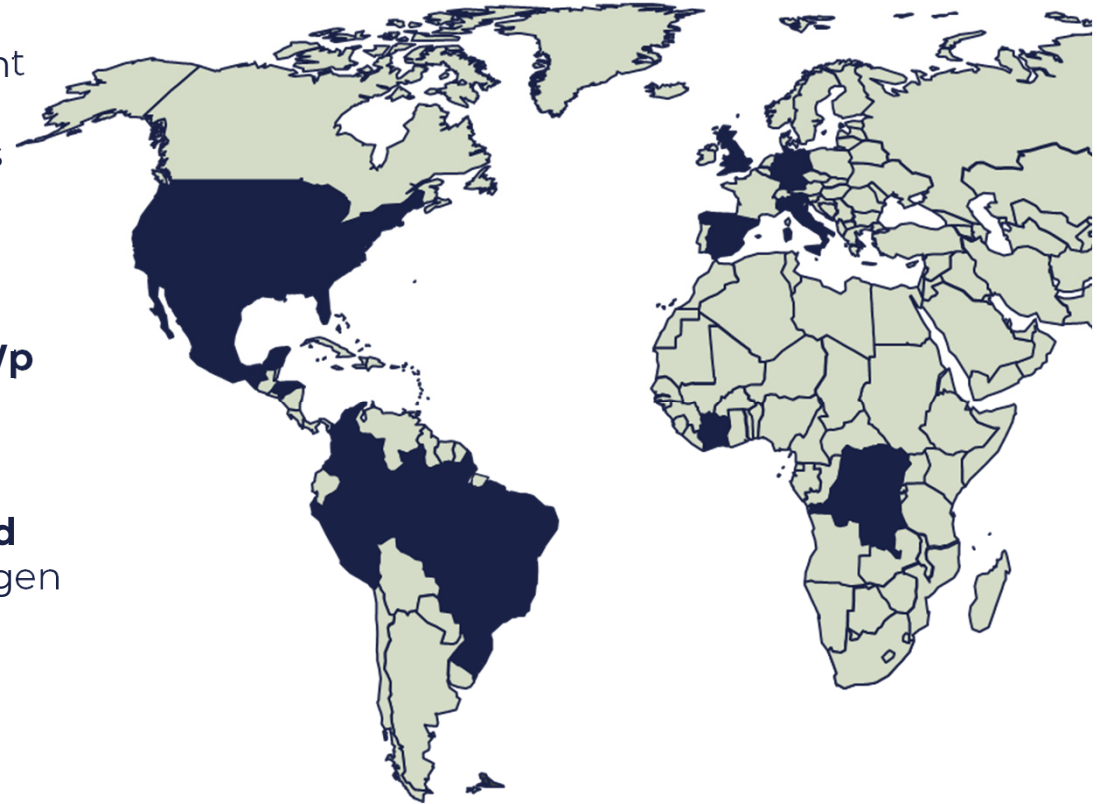
Current project pipeline: **2.2 GWp** of PV projects in Spain and approximately **7 GWp** worldwide.



Experience in the field of **hydrogen-based** technologies. Experts dedicated to hydrogen



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



Why Green Methanol?

Renewable Fuels (RFNBO)

- Fuel market actors in Germany obliged to reduce **carbon footprint by 25% by 2030**
→ **pressure to develop alternatives to fossil fuel.**
- Large potential for **hydrogen based fuels (RFNBO)**, particularly from import as potential for production in Germany is limited.

→ Market size of 250 TWh in 2030

- Methanol has a **high density** of hydrogen per each carbon unit
- Methanol can be transported **in liquid form at room temperature**
→ Existing transport infrastructure can be used

Development projects



Hydrogen projects in Spain - Confidential

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

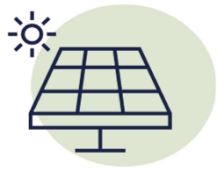
The project aims at producing yearly from mid 2027

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

SolWinHy Cádiz



Project Configuration



PV plant: 126 MWp **Wind Farm:** 60 MW

Location:  Arcos de la Frontera, Cadiz

No grid connection: power is generated exclusively from renewables, no impact on the national grid

CO2 Footprint

92% CO2 savings compared to EU fossil fuel benchmark (including transport)



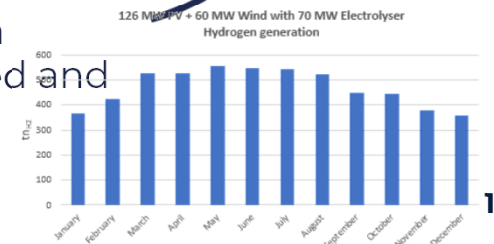
The green hydrogen will be converted into **30.000 t/year of green e-methanol.**



Electrolyser: PEM 70 MW
Production: 5.700 tH₂/year



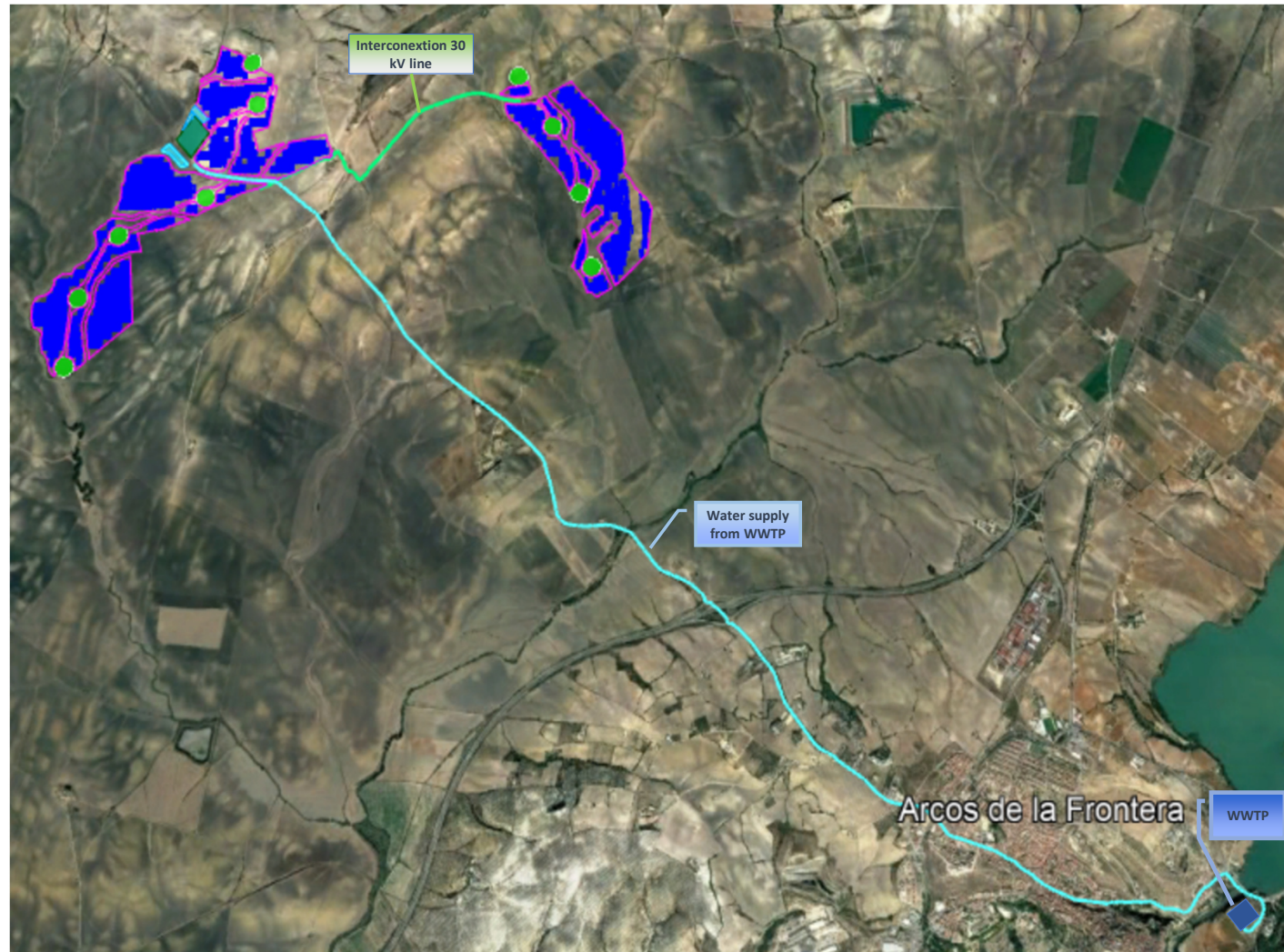
Biogenic CO₂ captured from a **biomass power plant** (liquified and transported).



Project configuration

Plant lay-out

- Water ponds (Evaporation and Storage)
- Process Plant
- Interconnection Line
- Wind Farm
- PV Plant
- Water pipe from the Municipal WWTP (Waste Water Treatment Plant)



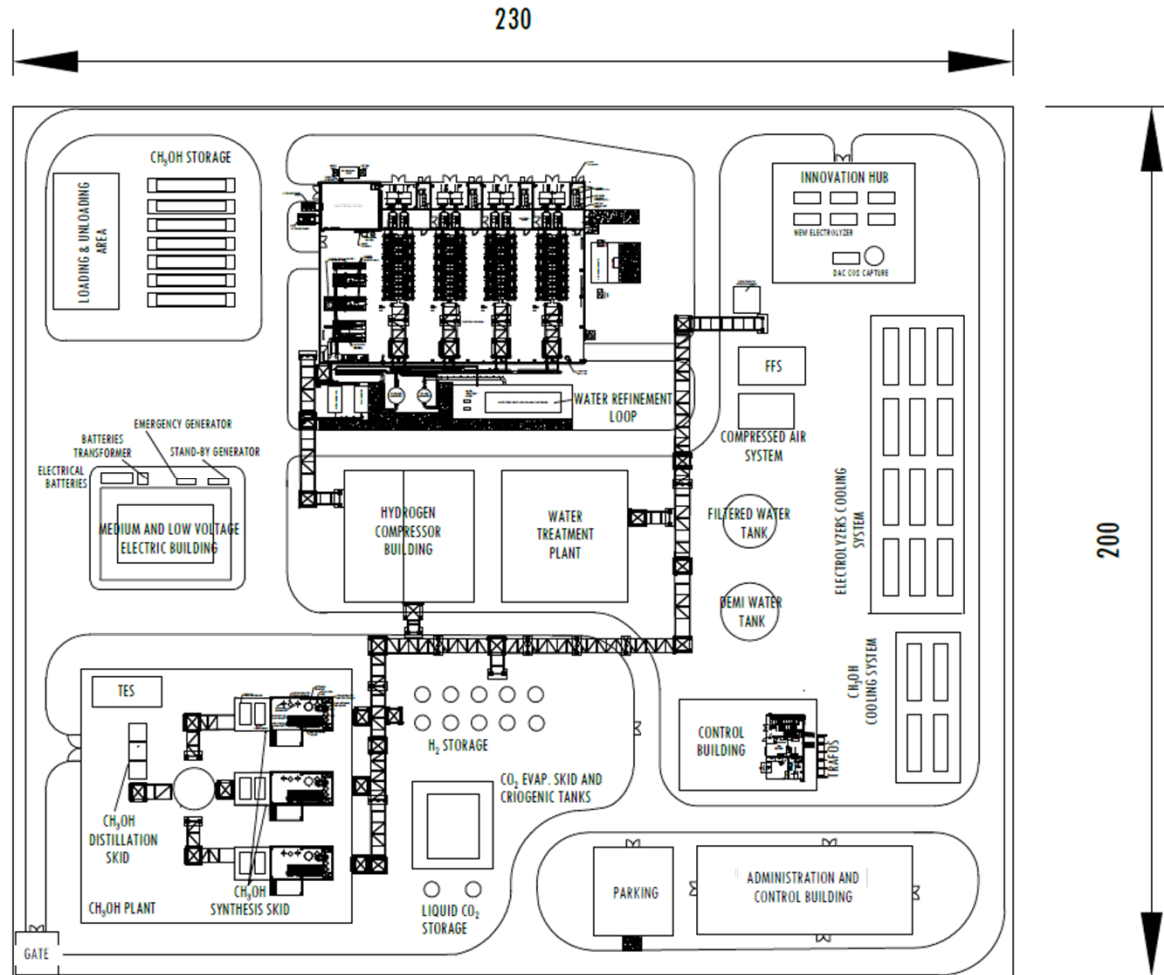
Project configuration

General disposition -Process plant location



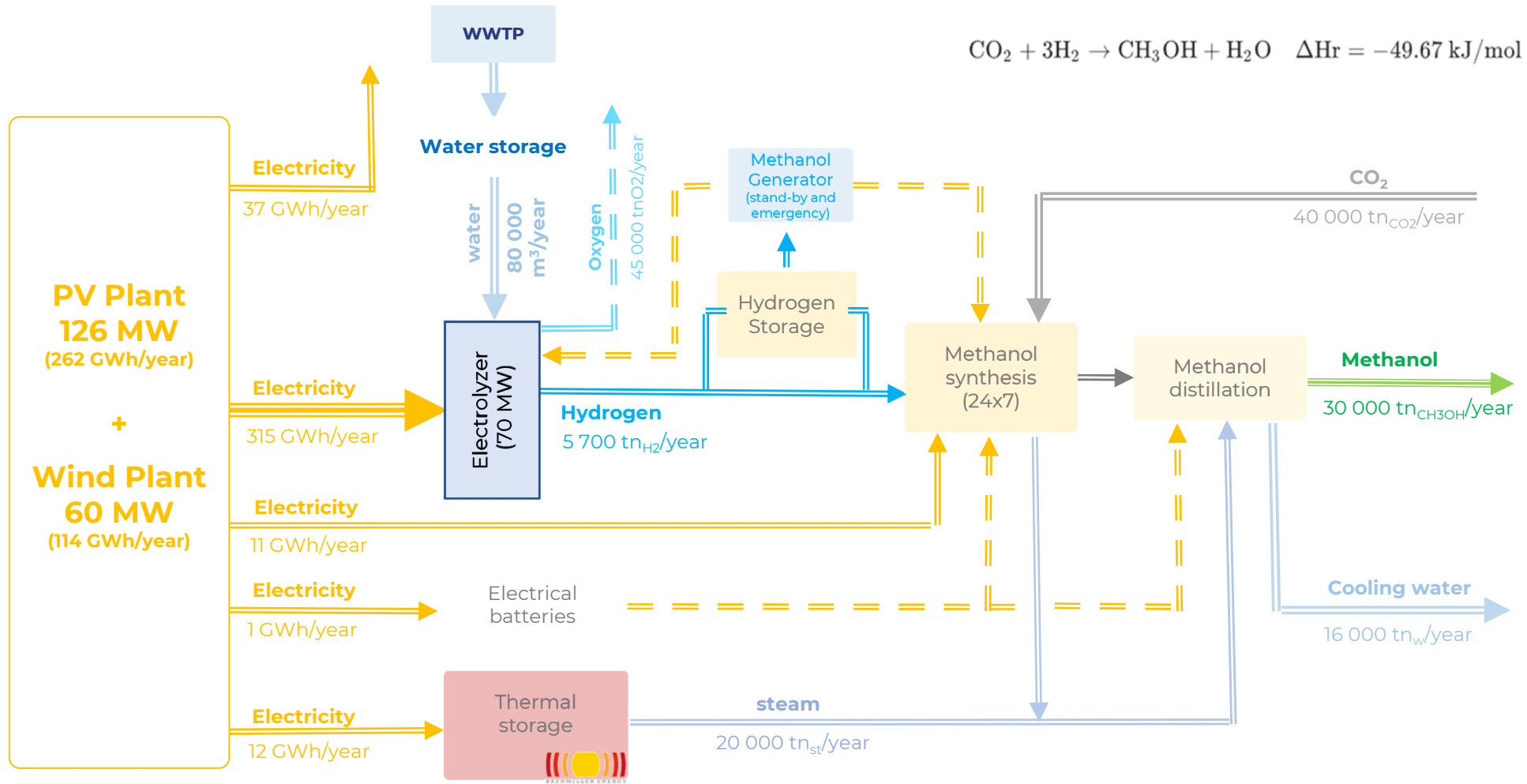
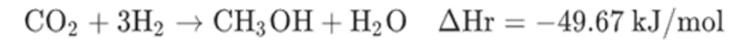
Project configuration

Layout process area



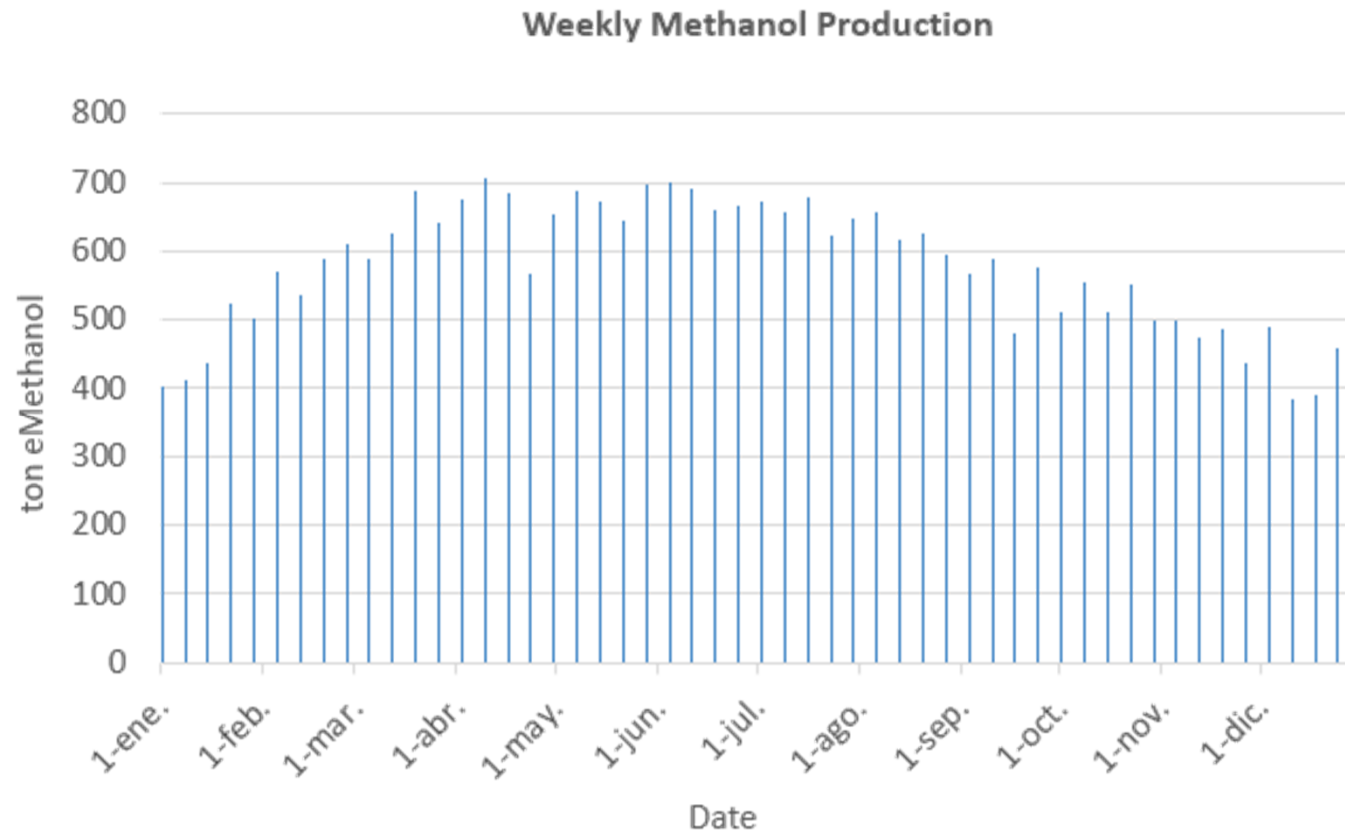
Project configuration

Process model



Project configuration

Weekly e-Methanol production



Timeline & Financing



Financing

- Financing (debt and equity) will be structured and organised by Viridi and Green Enesys.
- **Total Investment:** CAPEX **250m euro** (Wind, Solar/H2/Methanol)
OPEX ~ **11m euro/year**

Environmental Impacts and Carbon Footprint

CO₂ and Water

CO₂



- CO₂ reduction **92%** (compared to fossil benchmark)
- Green methanol considered (RED II): “Renewable Fuel of Non-Biological Origin” (**RFNBO**)
- Estimated CO₂ savings per year: **95 000 t CO₂ /year**

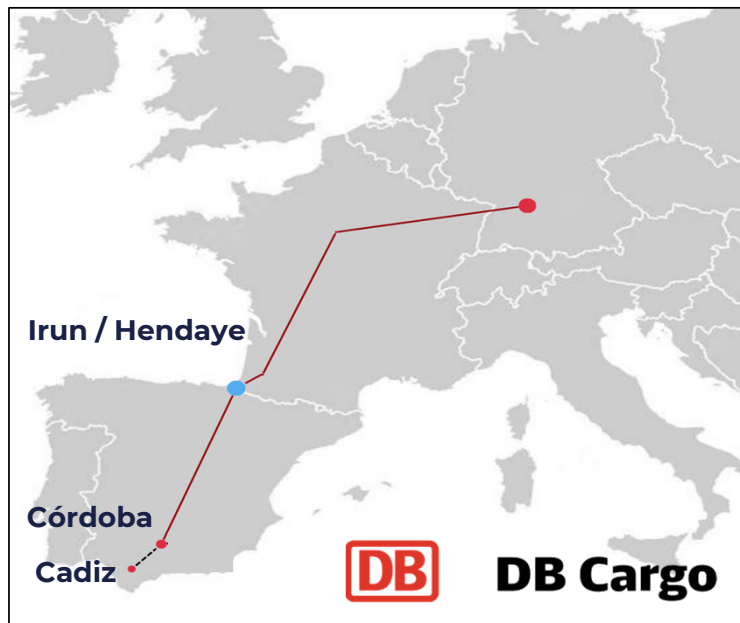
Water consumption



- Water consumption: **130 000 t/year**
- Water will be supplied from a local **Waste Water Treatment Plant**.
- Water as by-product from methanol production will be used in the auxiliary cooling plant
- A storage pond on-site is foreseen to stabilize water demand

Transport from Spain to Germany and offtake

- In Spain generation of **hydrogen** with wind and solar energy and synthesis to **Methanol**
- Transportation to **Germany** and refine the **methanol to gasoline**
- **Project** design, permitting, offtake-agreements in **advanced stage**
- The logistical concept was developed with the strategic partner **DB Cargo BTT.**



OFFTAKE

- The project is part of the initiative “**reFuels – Rethinking Fuels**” and is supported by the Ministry of Transport of Baden-Württemberg.
- Viridi is in discussion with **a large German refinery** in Baden-Württemberg about the off-take of green methanol.
- The methanol could be directly blended with conventional fuel, thus **reducing the carbon footprint.**
- Refinery has a **large demand** for methanol.

Hydrogen Rollout Strategy

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

The innovative configuration of the projects will serve as **blueprint** to be used in other locations of Southern Europe with good renewable energy resources.

	COD	Electrolyser (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
SolarCemHy Toledo	2027	140	300 PV	44.000 t/y
SolarBioHy Linares	2027	125	200 PV + 80 Wind	50.000 t/y
SolEoHy CLM	2028	500	800 PV + 300 Wind	200.000 t/y



SolWinHy Cádiz

Production & Transport of Green Methanol
from Spain to Germany



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