



POWERING TOGETHER A BETTER TOMORROW

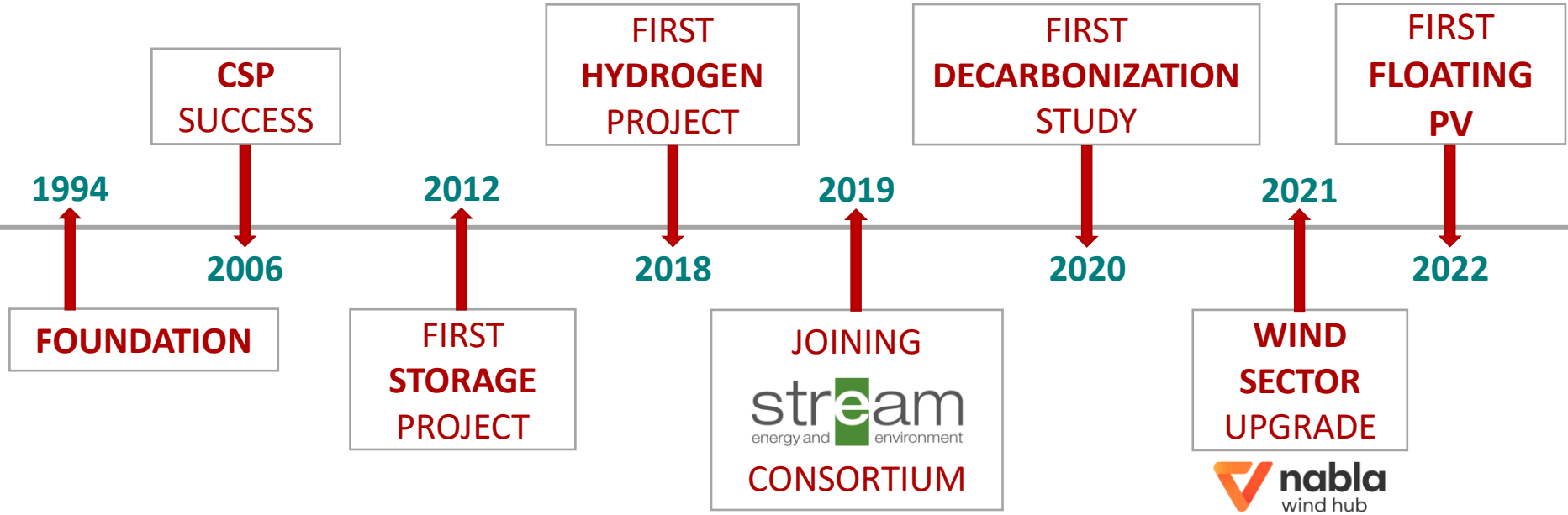
ENGINEERING SERVICES FOR ENERGY

ESE is an Italian engineering and consulting company operating worldwide
in the power generation, hydrogen and storage industry

WWW.ESESRL.COM

About ESE

ESE is certified ISO9001:2015



QUALIFIED TEAM

Permanent team of **25 persons** + top level consultants for all key specialties

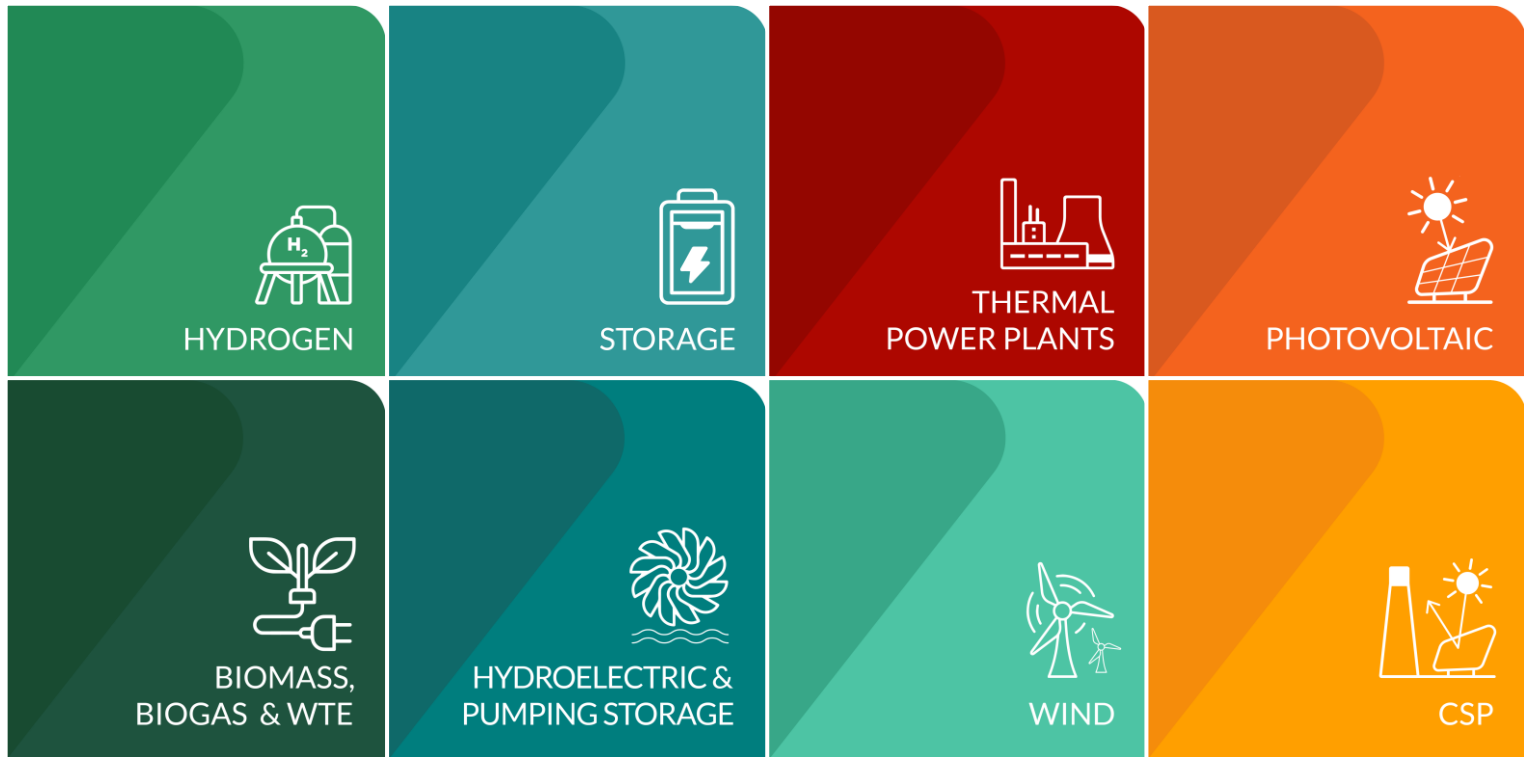
EFFICIENCY

ESE follows the Customer requirements in a very **flexible** way, thanks to its relatively small size

BENEFIT

ESE is a **Benefit Corporation** since 2021

Powering together a better tomorrow



- Decarbonization studies
- Due diligences
- Project management & EPCM

- Owner's Engineering, LTA, Tender services
- Engineering and Advanced engineering
- Economic, contractual and legal advisory

A better tomorrow everywhere

Our experience in the world



Why choosing ESE?

They already chose us



... and many more

ESE has completed its tasks **on time in 94% of cases**. The missing 6% includes cases in which delay was caused by or agreed with Customer

PUNCTUALITY

Customers have given ESE an **average score of 4.47 out of 5** in the last three years of Customer Satisfaction evaluations

REPUTATION

Since the beginning, ESE has always worked in an international environment, gaining expertise in **international standards and procedures**

INTERNATIONAL EXPERIENCE

Green H₂

ESE is involved with **green hydrogen** production **since 2018**

We design green **hydrogen** and green **ammonia** production plants from **renewable sources**, providing **complete support** to our Clients from **conceptual to realization phase**.

We have performed conceptual engineering studies for plants **from 150 kW to 800 MW** capacity.

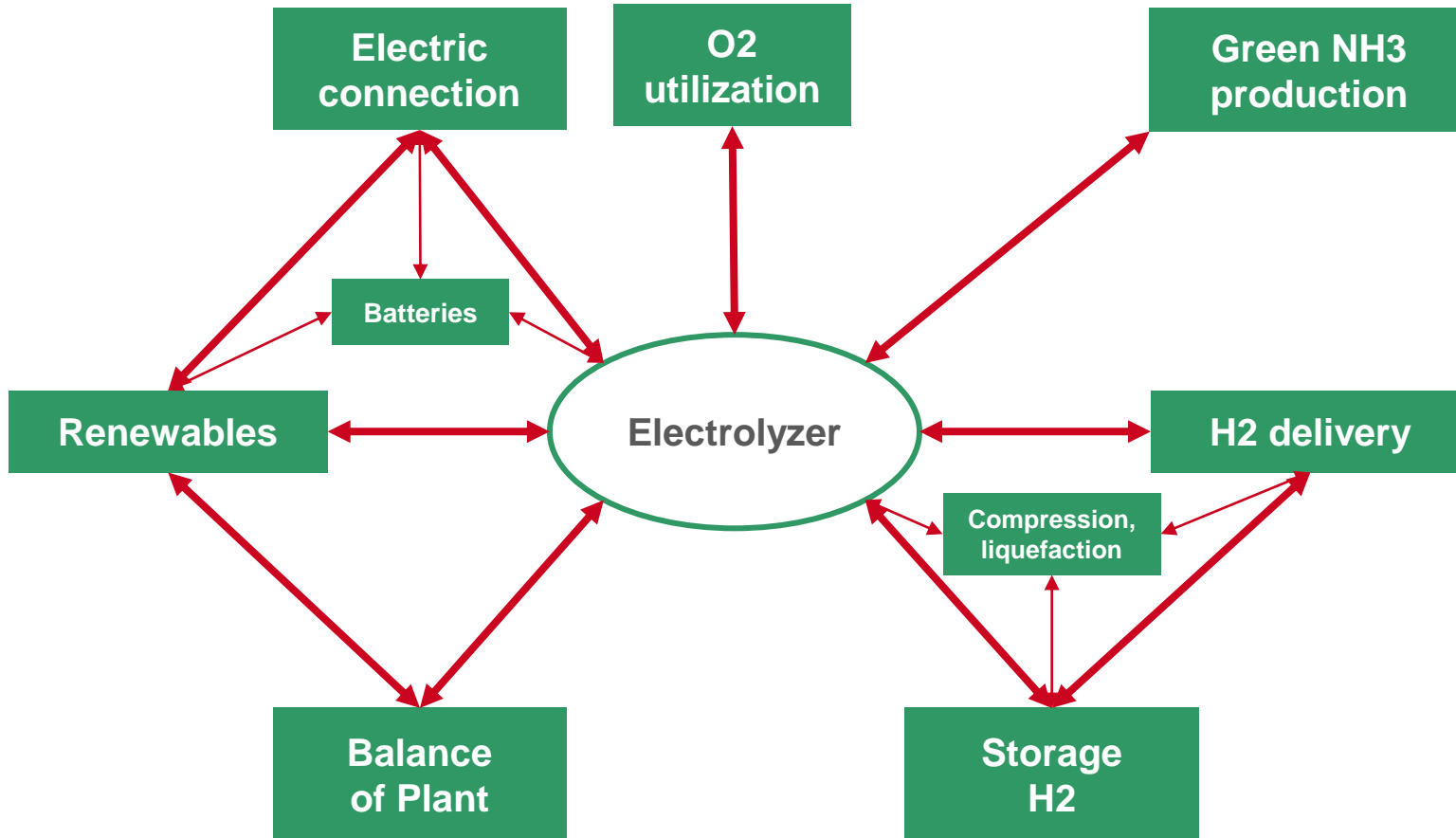
We have developed an in-house **software for the H₂ plant optimization** (RES, electrolyzers, storage).

We have designed a **natural gas and hydrogen mixer** for H₂ introduction in industrial processes, the as well as the necessary systems to feed Gas Turbines with hydrogen.

ESE, with Stream Consortium, is member of H2IT,
the Italian association for Hydrogen and Fuel cells technology

Complex plants well known by ESE

ESE has proven know-how on all the components involved in a green H2 Plant



HYDROGEN



STORAGE



PHOTOVOLTAIC



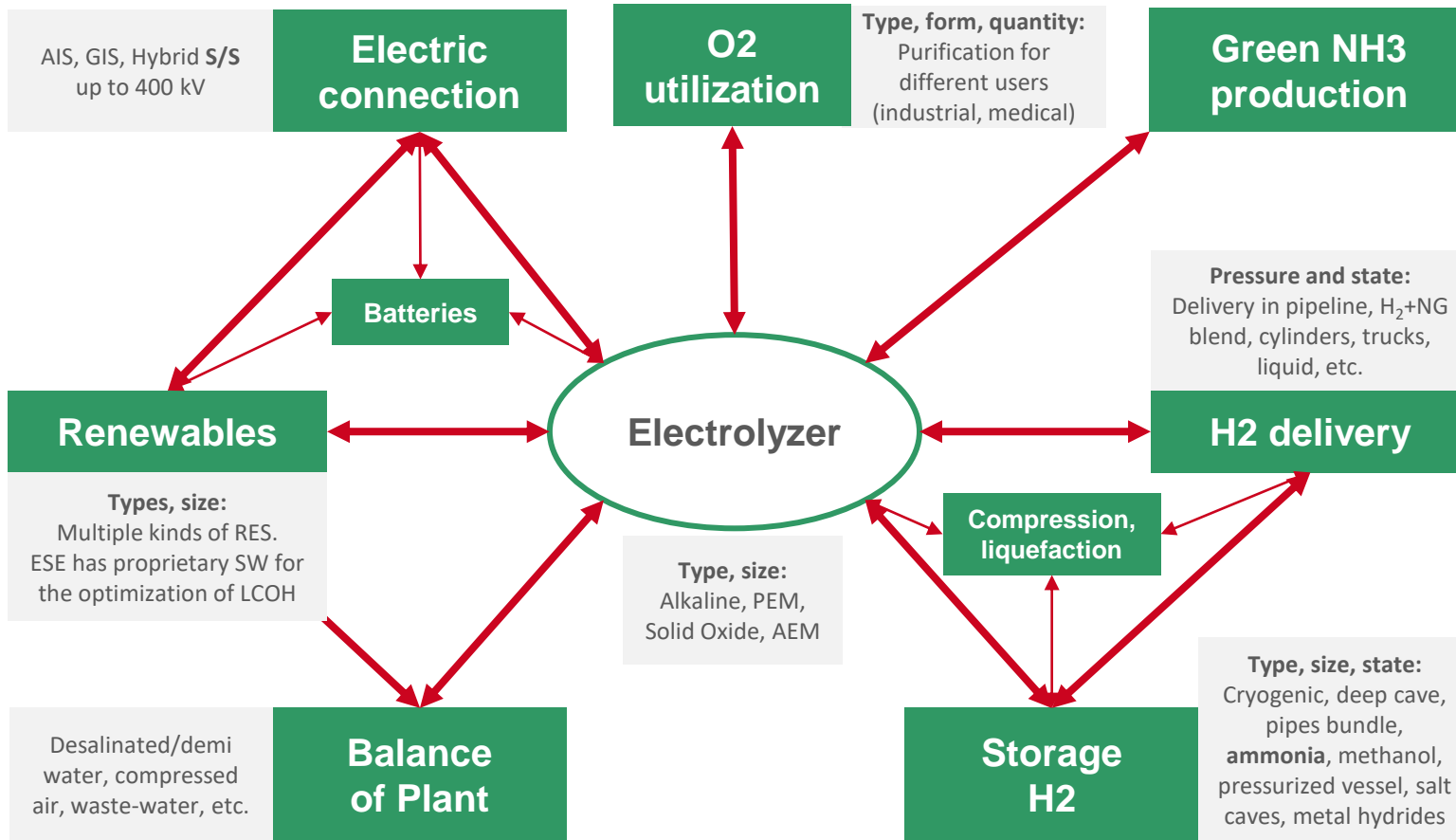
WIND



THERMAL POWER PLANTS

Complex plants well known by ESE

ESE has proven know-how on all the components involved in a green H2 Plant



Complex plants well known by ESE

ESE has proven know-how on all the components involved in a green H₂ and NH₃ Plant

Green NH₃

Sectors of expertise:

- Production
- Storage
- Cracking for conversion to hydrogen
- Nitrogen recirculation

Why is NH₃ interesting:

- **Transport:** NH₃ is well known as fuel for transportation
- **Storage:** way less expensive than H₂ storage and well known



SELECTED REFERENCES

Selected references / 1



YEAR	PROJECT
2023	Conceptual design of the fuel supply line and BOP equipment modifications required for the H2 conversion of Carrington and Pembroke GT26 1+1 power plants (Ansaldo turbine), for 25%, 42% and 100% H2 integration. Study on the Bottoming cycle (steam) and modifications cost estimation. Sector: power
2023	Basic design of a 1 MW Hydrogen production plant and the renewable plants used to power it (2.3 MW solar PV + 1 MW wind) for Sisecam SpA. Technical documents (layouts, SLD, PFD), economic assessment and technical support for the application for public tender for abandoned areas. Sector: glass industry
2023	Basic design of a 1 MW Hydrogen production plant and the renewable plants used to power it (600 kW solar PV + 2 MW wind) for Hope srl. Technical documents (layouts, SLD, PFD), economic assessment and technical support for the application for public tender for abandoned areas. Sector: industry
2022	Technical documentation for the EIA for a 600 MW Green H2 Production Plant fed by a 1.1 GW Wind Farm. for Hope Srl, as part of the Owner's Engineering activity. Plant process and technical docs (Layout, 3D Model, SLD, PFD, Equipment spec., etc.) and cost estimation. Sector: power, transport, industry
2022	Technical report for public tender and request for funds for a Green H ₂ Refueling Station in San Donà del Piave (Italy) for Simplifhy SB Srl.. Sector: transport
2022	Technical report and economic documentation for public tender for funds of Green H ₂ Refueling Station in Foggia (Italy) for Hope Srl. Sector: transport
2022	Owner's Engineering for a Green H ₂ Production and Refueling Station in Bari (Italy), including a new PV plant, for Hope Srl.. Sector: transport
2022	Pre-feasibility study for an 800 MW Green H2 Production Plant fed by a 1.8 GW Wind Farm for Green Bridge Srl. Sector: power, transport, industry

Selected references / 2



YEAR	PROJECT
2022	Owner's Engineering for a Green H ₂ Demonstration Project in Taranto (Italy) composed by a PV plant, a 50kW electrolyzer, a storage system and a H ₂ feeding system for a Public Bus. Sector: transport
2022	Reference Plant for a 1 MW Green H ₂ Production Plant, including the relevant PV plant feeding the 2 x 500 kW H ₂ Plant, in partnership with a company specialized in the supply of small and medium size electrolyzers. Sector: transport, industry
2022	Pre-feasibility study for an off-shore wind farm with BESS (day/night), H ₂ production system, H ₂ seasonal storage and fuel cell for 24/7 electricity production, for small touristic islands, able to sustain the summer extra-loads. Sector: transport, industry
2022	Basic process design of a hydrogen and natural gas mixer delivering 30 MWth, from full hydrogen to full gas, including HAZOP study. Sector: steel industry
2021	Feasibility study, including cost/benefit assessment, for a 50+50MW Hydrogen production facility in the South of Italy for an undisclosed Client (Italy). It also includes: <ul style="list-style-type: none"> • Possible extension to 200MW. • Study of the available renewable sources (PV, Wind and Biomass) • Analysis of possible Storage Solutions. • Calculation of the resulting LCOH • Analysis of the different streams of H₂ utilization: natural gas network, public train system, H₂ vehicles refueling, industrial clients. Sector: transport, industry
2021	Software development for the optimization of the panel of renewables used for the green Hydrogen production and consequent LCOH optimization. Sector: transport, industry

Selected references / 3



YEAR	PROJECT
2021	<p>Feasibility study for different solutions for H2 storage. Ongoing study, partially developed with the Politecnico of Milan. It refers to:</p> <ul style="list-style-type: none"> • Gaseous storage, in tanks or large pipes • NH3 storage • Gaseous storage in deep artificial caves • Cryogenic storage
2021	<p>Evaluation of investment opportunities by updating technology and decarbonization of the production and heating system for two industrial compounds for Gualapack (Italy). It includes:</p> <ul style="list-style-type: none"> • Analysis of possible alternative sources and solutions as heat pump, electric heating, additional PV plants, storage systems, green hydrogen (H2). • Regulatory framework and possible reforms. <p>Sector: packaging industry</p>
2021	<p>Feasibility study for self-standing off-grid PV+H2 solutions for isolated houses and small villages to substitute or minimize the use of diesel fuel. – Ongoing. Sector: transport</p>
2020	<p>Foundation and participation to Econsience H2, an international think talk group working to analyze all possible aspects of the development of a hydrogen-based world, considering the whole hydrogen supply chain as well as the possible form of utilization. – Ongoing</p>
2019	<p>Feasibility Study for 80MW Hydrogen production facilities inside a large CCPP plant in northern Italy for Simeco (Italy), for an oil&gas leading Italian company, including:</p> <ul style="list-style-type: none"> • Comparison of PEM vs Alkaline Electrolyzers (involving Vendors) on the basis of price, performance, flexibility attributes, Opex. • Design and costing of the BoP, calculation of the Levelized Cost of Hydrogen, for the optimal solution. • Pre-design of the H2 compression system. <p>Sector: Oil & gas</p>

SELECTED CASE STUDIES

1. Green H₂ production plant 600 MW plant sizing



Country	ITALY
Client	HOPE s.r.l.
From / To (month/year)	From: 04/2022 To: ongoing
Value of the contract	€ 150,000
Status of the project	Under environmental permit

- Engineering and Advanced engineering
- Owner's Engineering

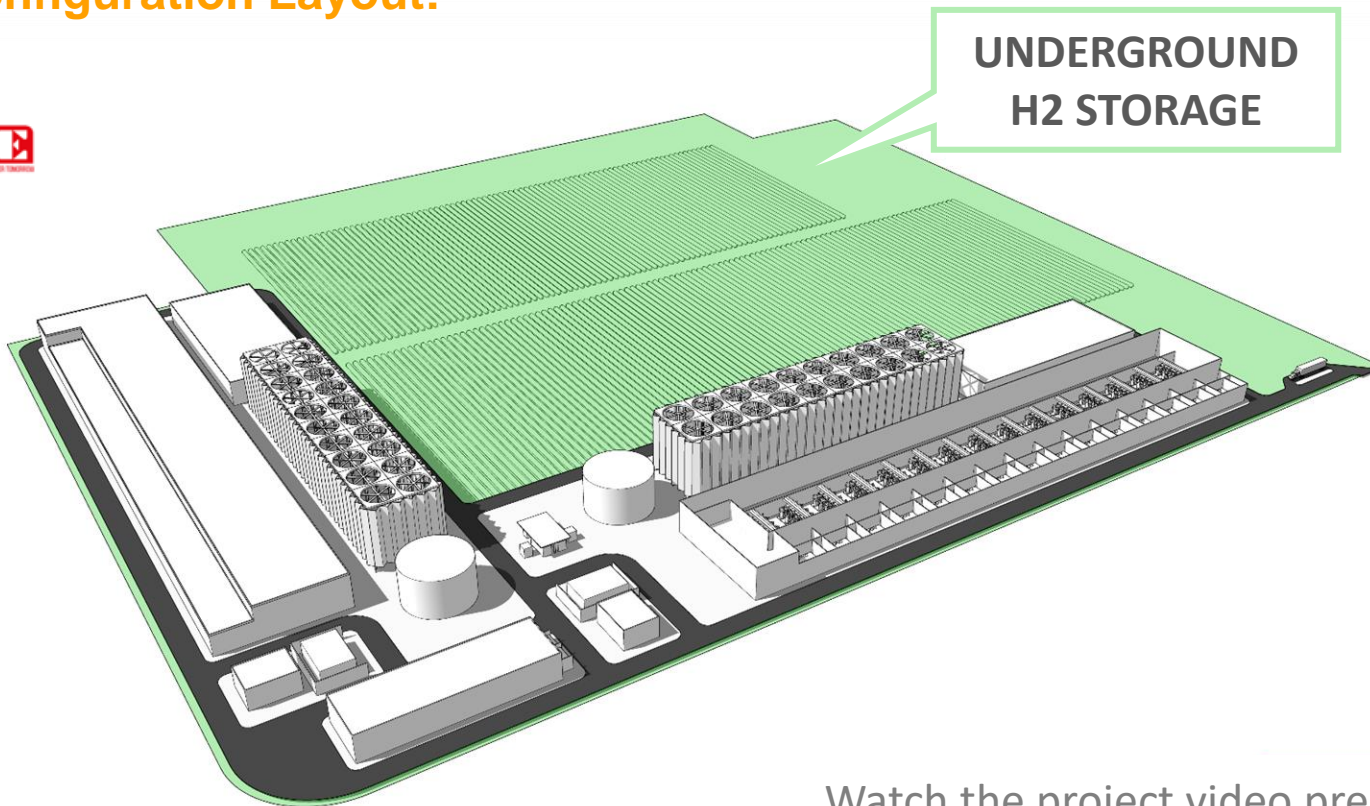
Feasibility study and O.E. of a **600 MW Green Hydrogen production plant** fed by a **1,2 GW offshore wind** farm located in the Apulian Adriatic sea, Italy. The study aims at **EIA preparation** to obtain the permits for plant construction.

Main Tasks:

- **Preliminary sizing of:**
 - Electrolyzers and plant auxiliaries
 - Storage systems: H₂ storage; O₂ and battery storage (if needed)
 - Electric substation
- **Preliminary layout**
- **Plant cost estimation**
- **EIA documentation preparation**

1. Green H₂ production plant 600 MW plant sizing

Configuration Layout:



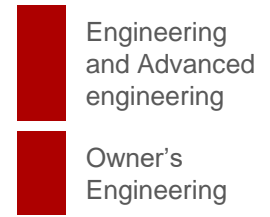
- Engineering and Advanced engineering
- Owner's Engineering

Watch the project video presentation [HERE](#)

2. Green H₂ production plant 200 kg/day refueling station



Country	ITALY
Client	HOPE s.r.l.
From / To (month/year)	From: 11/2022 To: 12/2022
Value of the contract	€ 15,000 (Step 1 only)
Status of the project	Under financial approval



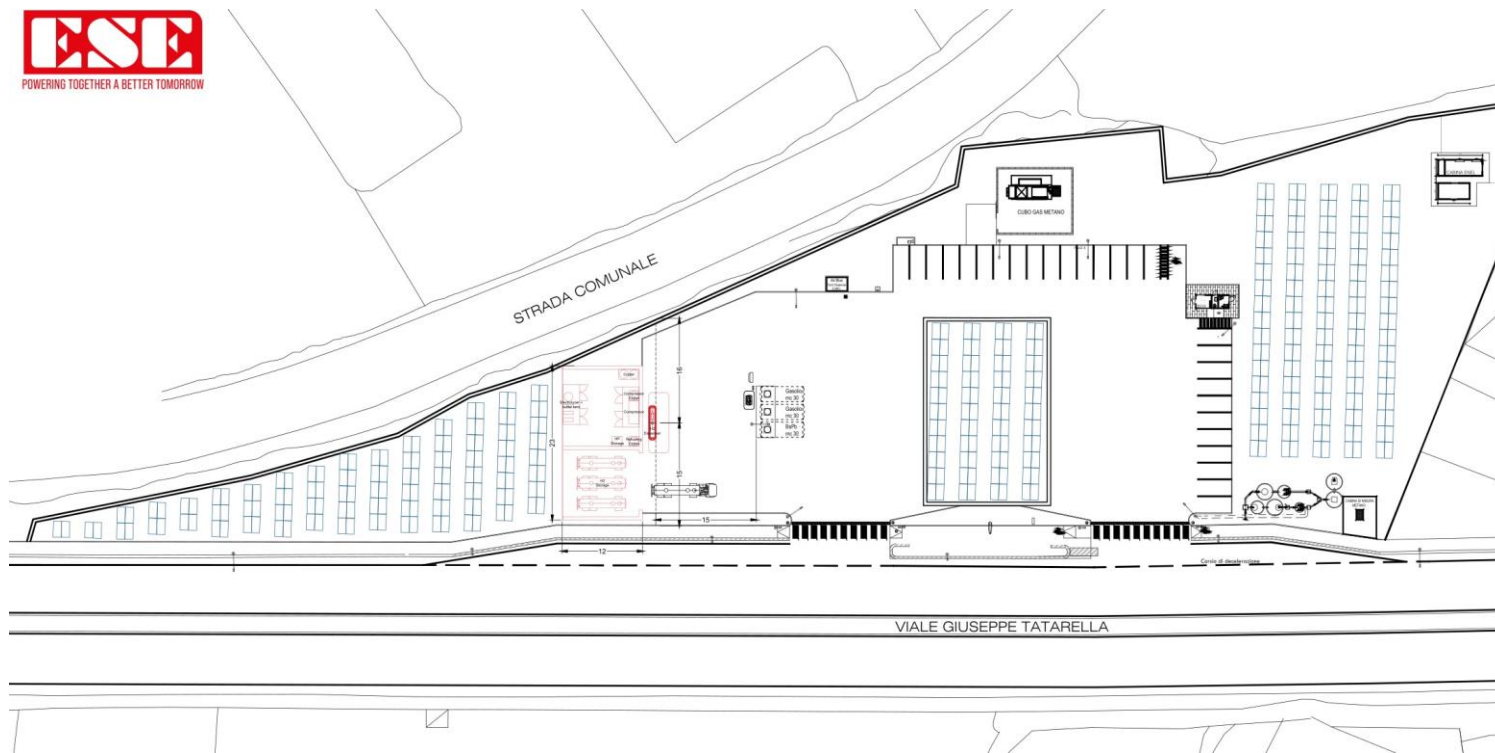
Step 1: preliminary sizing of a **200 kg/day Green Hydrogen refueling station** in Bari, Italy. The station will consist of a **150 kW electrolyzer plant**, fed by a **250 kW PV plant** and renewable electricity from the grid. The station will also import part of the green H₂ produced in Barium Bay plant (following steps). The aim is to **apply for a public tender for project financing**.

Main Tasks:

- Vehicular traffic estimation
- Preliminary sizing of H₂ production plant (electrolyzers, storage, etc.)
- Plant cost estimation
- CO₂ savings estimation

2. Green H₂ production plant 200 kg/day refueling station

Configuration Layout:



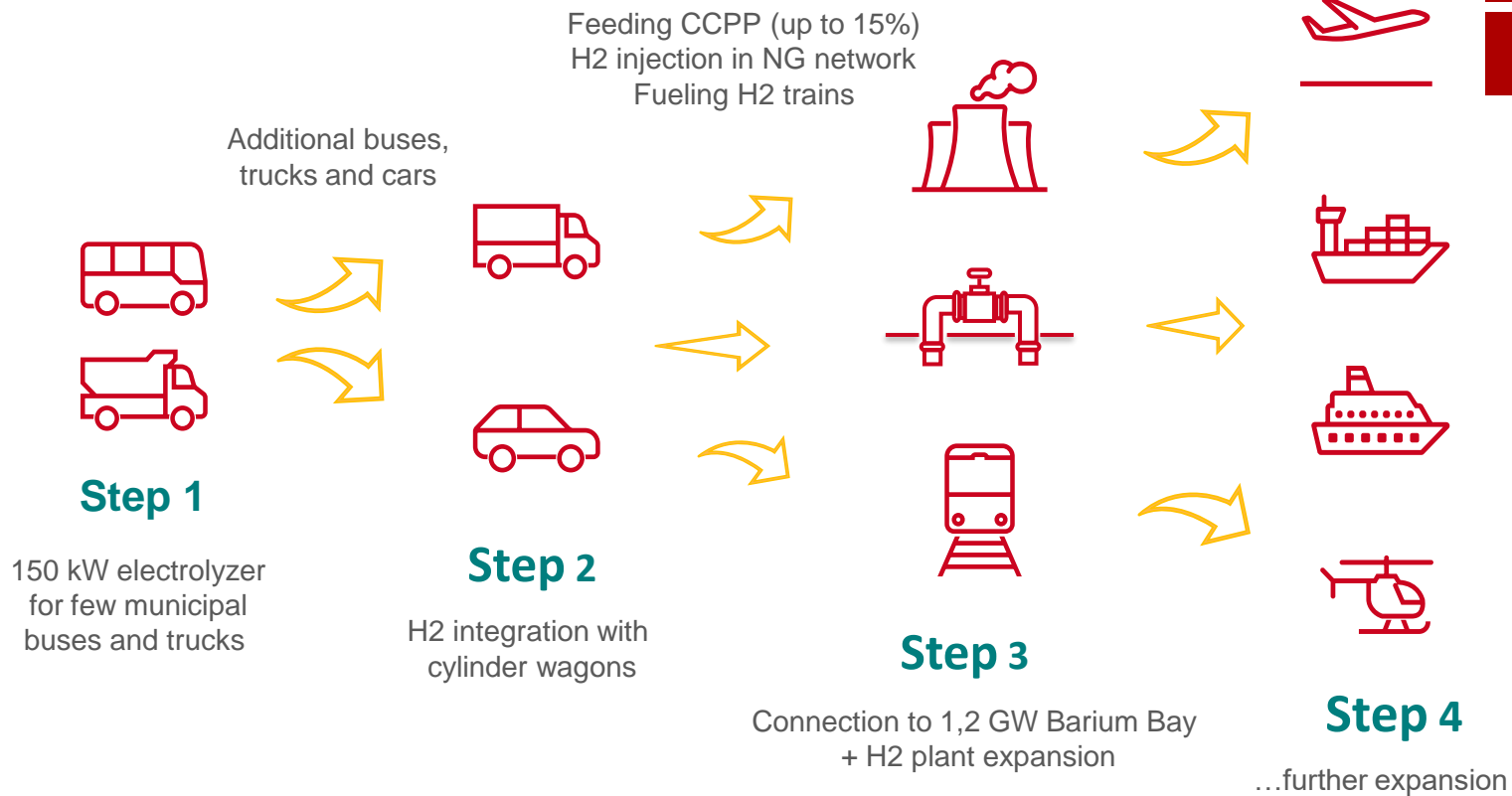
- Engineering and Advanced engineering
- Owner's Engineering

3. Growing a H₂ fueled town

The technologic dream of Bari



Possible future developments of the project:



- Engineering and Advanced engineering
- Owner's Engineering



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THANK YOU!

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