

Pitch deck



Spiral Hydrogen

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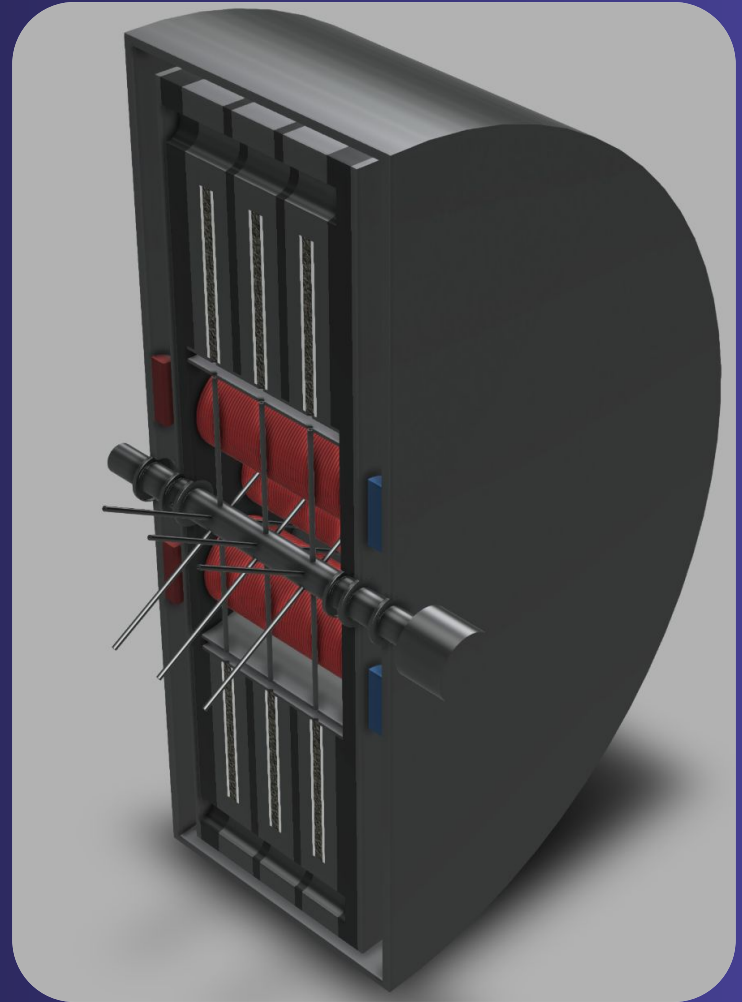
Spiral Hydrogen

Established Sep. 2024

Patent-pending technology

96% efficiency (41.1 kWh/kg incl BoP)

Levelized Cost of Hydrogen 1.5–2 EUR/kg
4–5 x cheaper



Problem:

Green hydrogen is expensive

Over 98% of the world's hydrogen industry relies on fossil fuels. It is simply 2–4x cheaper to produce hydrogen from fossil fuels than from renewables.

Why:

1. Complex infrastructure

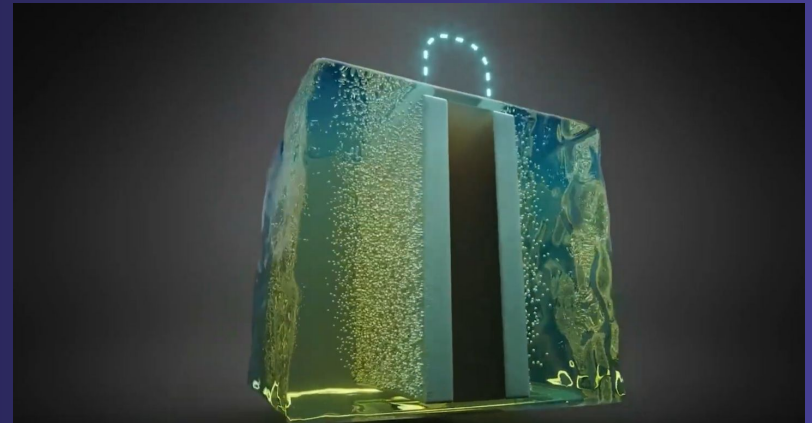
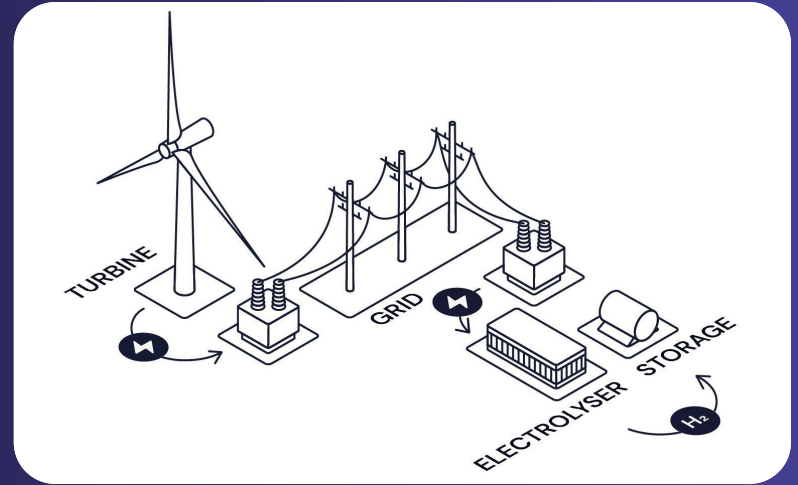
CAPEX and OPEX of grid, balance of plant, and power electronics

2. Inefficient electrolysis

60–70% efficiency

This is because of

- gas buildup** on electrodes, which decreases conductivity, and
- separate pumping and cooling** systems, requiring additional energy.



Solution:

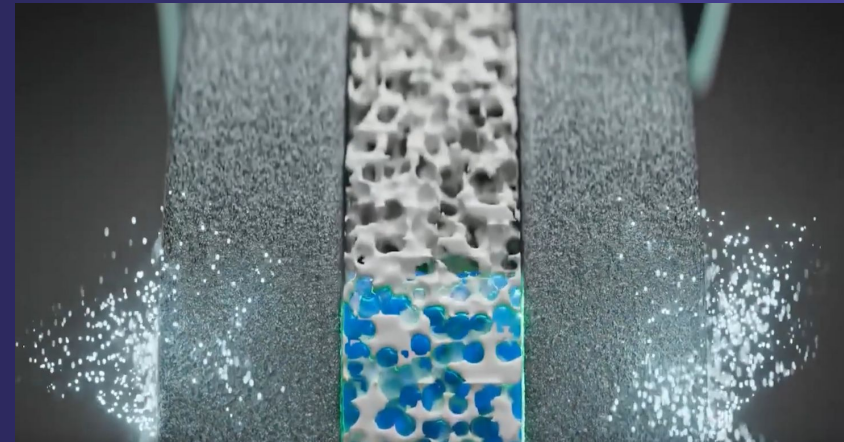
How:

1. All physics happening inside one device
Mechanical > Electrical > Chemical H₂ energy conversion

2. Bubble free electrolysis

No active side blockage, less electrical resistance

It is 100% grid-independent. It works with any rotational energy source.



Hysata capillary-fed electrolyzer

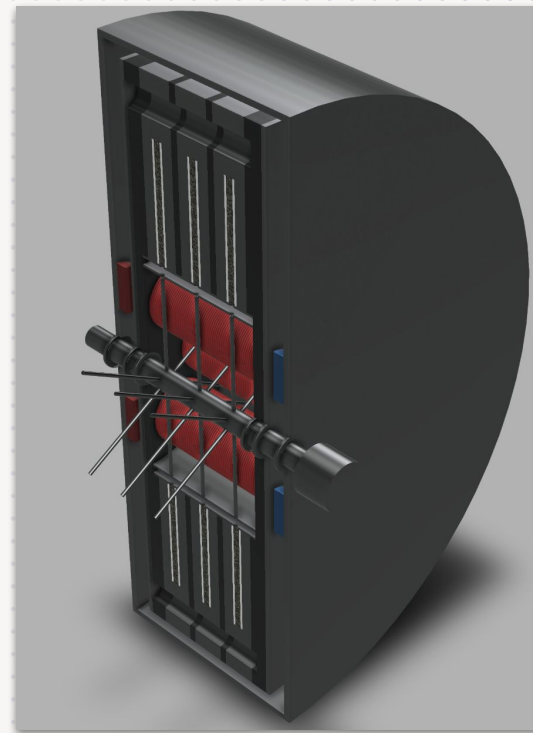
Product: Yubin 1.0

Technical details

Our product is an **all-in-one, bubble-free centrifugal electrolyzer** with an **embedded axial flux generator**.

Here are its main features:

- **Bubble-Free Electrolysis** — Prevents gas buildup on electrodes, achieving up to 96% hydrogen production efficiency.
- **Centrifugal Design** — Naturally pumps and cools the electrolyte through rotation, eliminating the need for external pumps or separate cooling systems.
- **Axial Flux Generator** — Coils on the rotor, magnets on the stator—no slip rings, compact, high-torque, and low-friction power generation. Within one rotating unit electrical power is produced and consumed for hydrogen production.
- **Integrated and Self-Powered** — Converts mechanical energy directly into electrical power for electrolysis, operating independently of external power sources.
- **Scalable and Low-Maintenance** — Modular design for easy scaling and reduced maintenance costs. You can put multiple units on one rotating shaft.



Cross-section of our device: Yubin 1.0.

Market

Hydrogen market's future and our position

Total Addressable Market

Already in 2025, the global hydrogen market is estimated at \$170–200B and expected to double by 2030 (0, 1). We can address this entire market due to our hydrogen being cost-competitive with fossil-based alternatives.

This is why we place our **Total Addressable Market at \$400B**, taking into account global hydrogen production market predictions by 2030.

Serviceable Addressable Market

Our Serviceable Addressable Market (SAM) focuses on global electrolyzer sales, as our current business model focuses on B2B sales of our hydrogen production units.

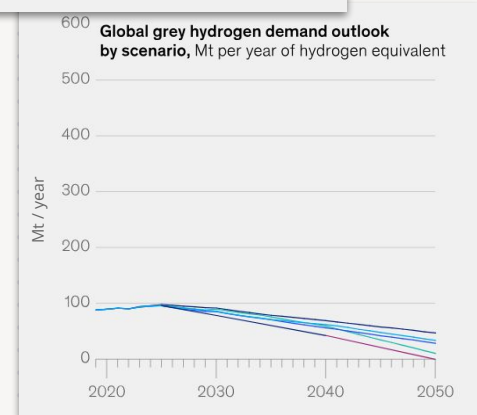
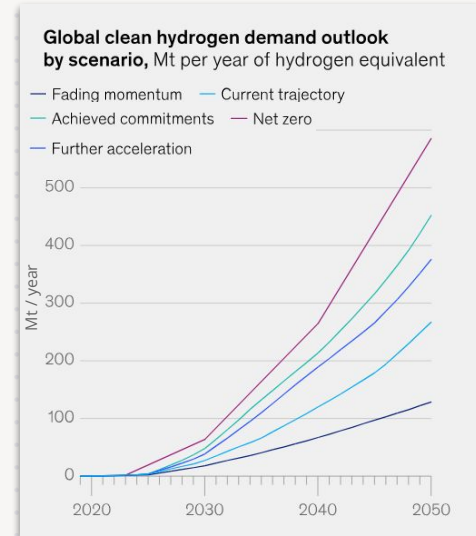
This market is estimated at \$1–4B today and expected to grow at a high rate of 50–70% CAGR (2, 3). This is why we set our **SAM at \$20–70B**, taking into account estimates for the market by 2030.

Serviceable Obtainable Market

Our Serviceable Obtainable Market (SOM) takes into account the realistic portion of SAM we could capture, taking into account our unique efficiency (up to 96%) and strong economic benefits (5x lower LCOH).

By 2035, we wish to capture 1–5% of the market, utilizing partnerships with turbine manufacturers and energy companies to accelerate our entry. This is why we place our SOM at **\$0.2–3.5B**.

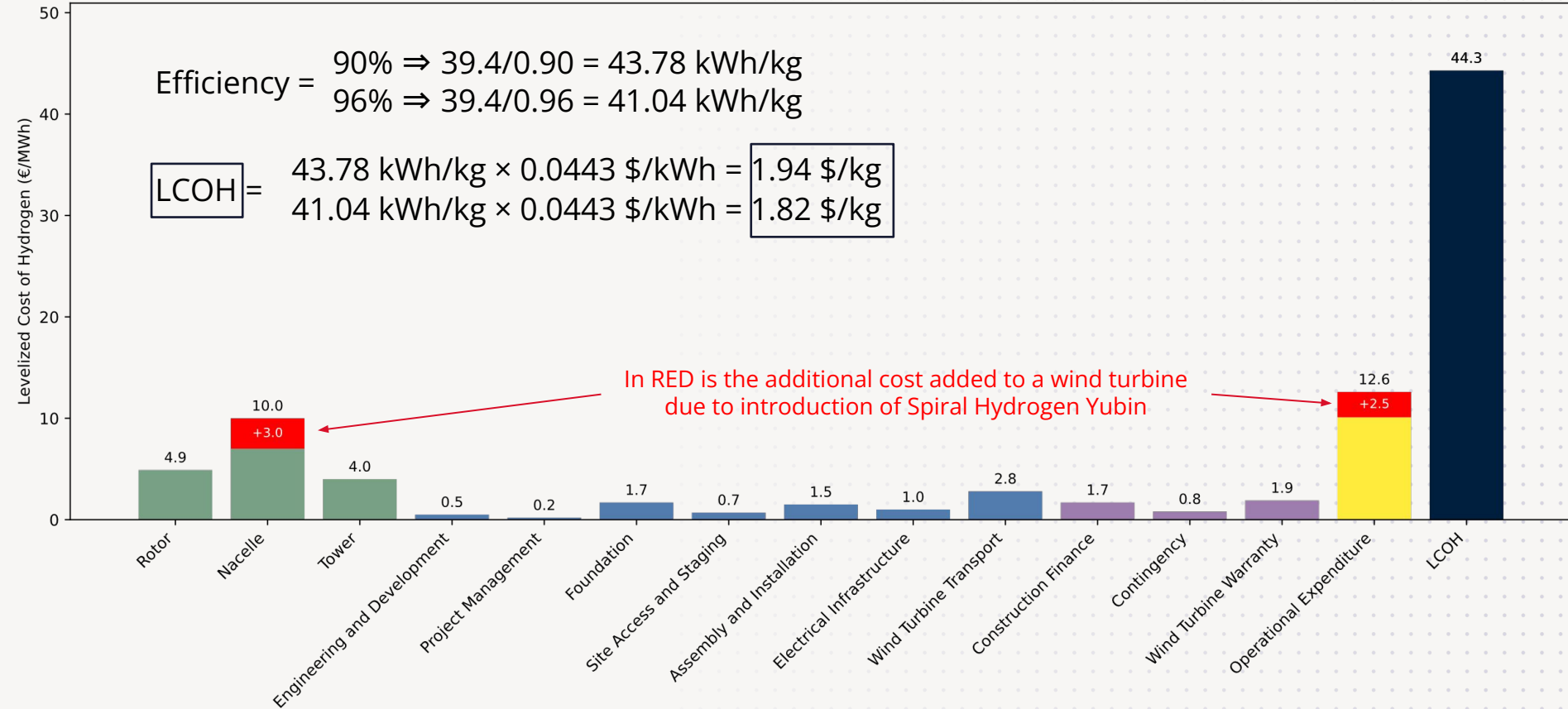
Green hydrogen comes. Gray hydrogen leaves. (McKinsey, 2024)



Cost Breakdown for Spiral Hydrogen via Electrolysis (Based on Land-Based Wind Turbine Inputs)

Efficiency = 90% \Rightarrow $39.4/0.90 = 43.78$ kWh/kg
 Efficiency = 96% \Rightarrow $39.4/0.96 = 41.04$ kWh/kg

LCOH = 43.78 kWh/kg \times 0.0443 \$/kWh = 1.94 \$/kg
 41.04 kWh/kg \times 0.0443 \$/kWh = 1.82 \$/kg



Based on a land-based wind turbine cost breakdown from NREL (2022): <https://www.nrel.gov/docs/fy24osti/88335.pdf>

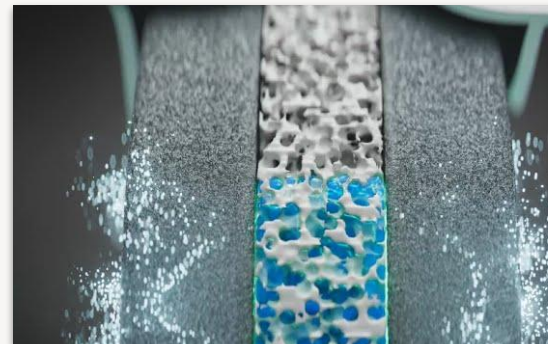
Competition

Hysata is a fast-growing electrolyzer producer operating in Australia and our closest competitor in terms of technology.

Advantages over traditional alkaline electrolyzers are clear – higher efficiency, lower CapEx, lower LCOH.

Advantages over Hysata include using centrifugal force, which doesn't limit our electrolyzer size and mass transport capabilities (capillary force has column height and electrolyte transportation limitations), lower CapEx because of compact design, and not relying on the grid (which is a limitation for Hysata).

Key factors	Hysata	Traditional alkaline	Spiral Hydrogen
Electrolyzer efficiency	~95-98%	~60-70%	~96%
Power source	Grid-dependent	Grid-dependent	Fully decentralized
Gas bubble management	No bubbles	Gas buildup	No bubbles
Pumping and cooling	Separate systems required, consuming energy	Separate systems required, consuming energy	Naturally pumps and cools via centrifugal force.
Infrastructure complexity	Moderately high (grid + moderate pumping)	High (grid + high-throughput pumping)	Low. Simplified and integrated system. Minimal CapEx.



Hysata's capillary-fed electrolyzer ([Source](#))



Alkaline electrolyzer stack

Roadmap

We are at a pre-revenue, **pre-seed stage** with a working prototype (TRL 4).

We have raised **119,000€ in non-dilutive grants**.

In May 2025, we came 1st in Prototron, a startup competition of over 200 participants.

We have also recently joined the European Space Agency (ESA) incubation program.

September 2024

- **First concepts** drafted

December 2024

- **Patent filed** (100% company ownership)
- **Lab-scale prototype** completed, validating the core of our system – the electrochemical process.

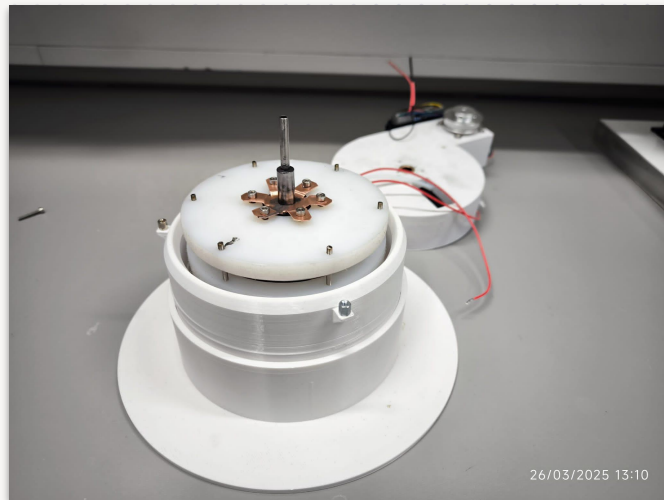
Sept 2025 (Plan)

- We aim to complete the **full prototype**, including the generator and the electrolyzer parts, integrated in micro-scale wind turbine (1-2m in diameter).

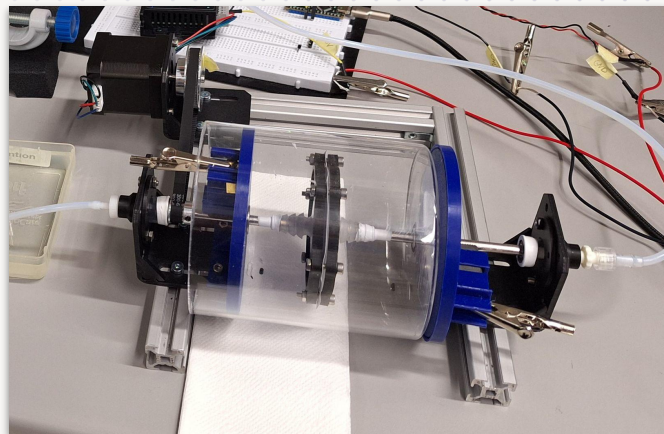
December 2026 (Plan)

- We plan to finish a **fully operational pilot**: a 5–20kW wind turbine installed in the field, capable of producing hydrogen efficiently and reliably. The exact scale depends on our partners. (TRL 6)

We are actively conducting customer validation and talking closely with several renewable energy organisations about potential pilot collaborations.



Yubin 0.4



First prototype Yubin 0.1



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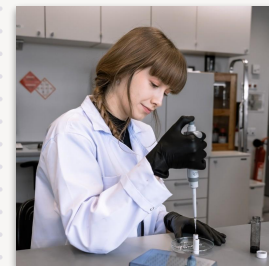
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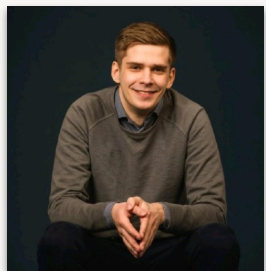
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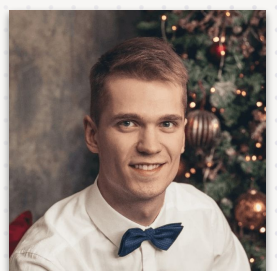
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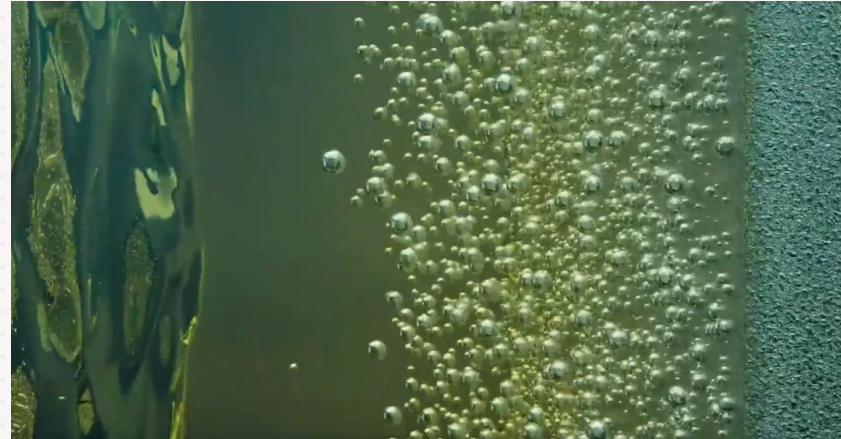
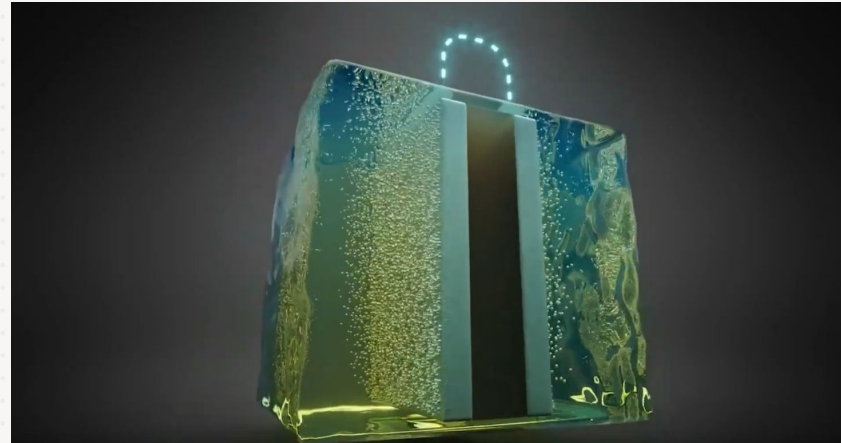
*Operations
3y in scaling up
organisations*

Technical details

Traditional electrolysis

In the traditional green hydrogen production process, **gas bubbles** (hydrogen and oxygen) form on the electrodes, block the active sites and decreases conductivity.

This significantly decreases hydrogen production efficiency.



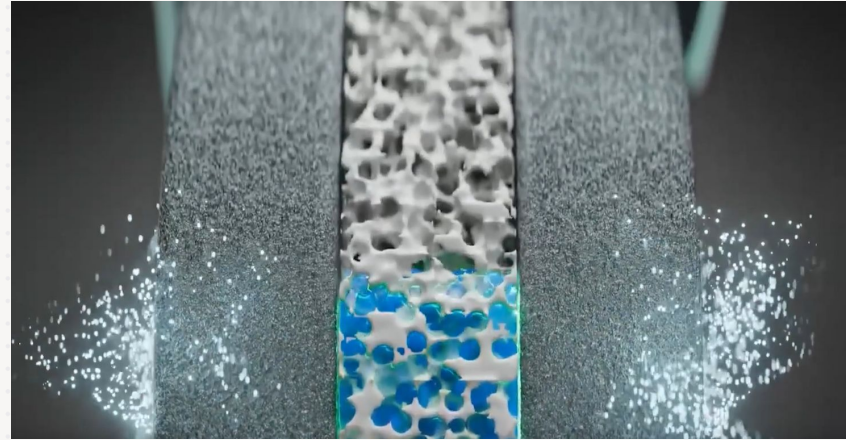
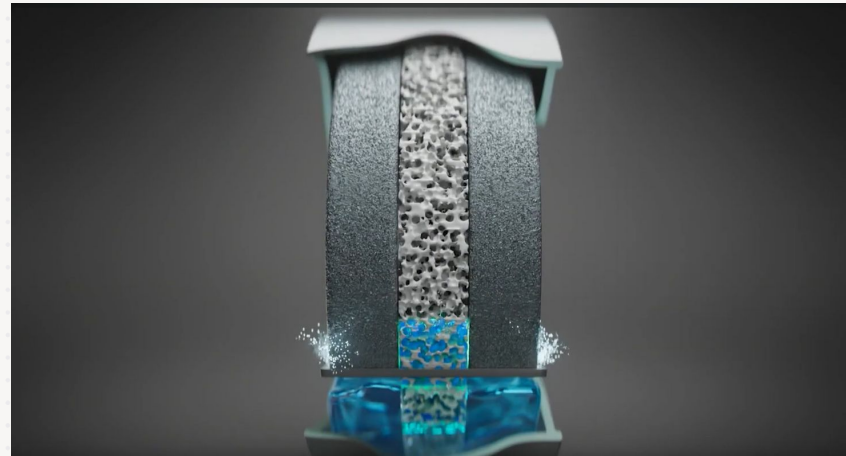
Bubble-free electrolysis

We (and our competitors Hysata) are the only two companies in the world, which use **bubble-free** electrolysis.

In those cases the electrochemical stack is **not submerged** in the solution, but the electrolyte is fed through the porous separator. With a porous, hydrophobic, yet conductive electrodes, one can maintain **consistent electrical contact** with the solution while gas bubbles escape through the pores.

The image on the right shows water being fed by **capillary action** (Hysata). Our solution differs by using **centrifugal force instead**.

This is the main design factor contributing to our high (90-95%) electrolyzer stack efficiency.

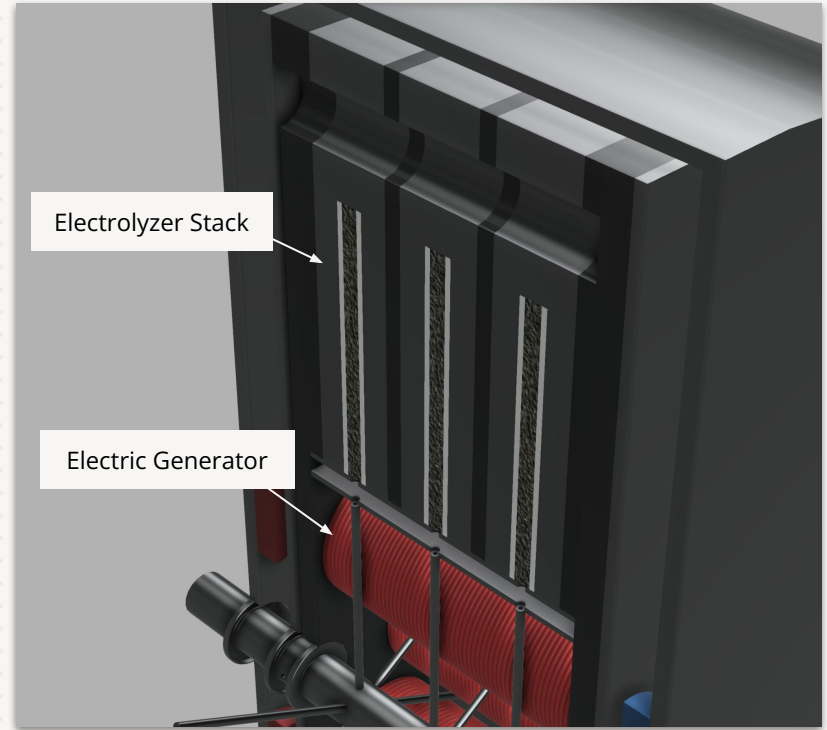


Our design

Our electrolyzer is using **centrifugal force** eliminating mass transport and scaling constraints imposed by electrolyte flow limitations and maximal electrolyte column height in capillary driven design.

The entire device rotates as one unit, **naturally pumping** the electrolyte while **cooling** both the generator and the electrolyzer stack.

Additionally, our design uniquely includes an **embedded electric generator**, which powers the electrolyzer with **no need** for slip rings, complex **power electronics** nor **grid connection**.



Our design

Step-by-step

On the right you see a cross-section of our device.

Step 1. A source of rotational mechanical energy makes the device rotate.

Step 2. The electrolyte is fed in through the shaft.

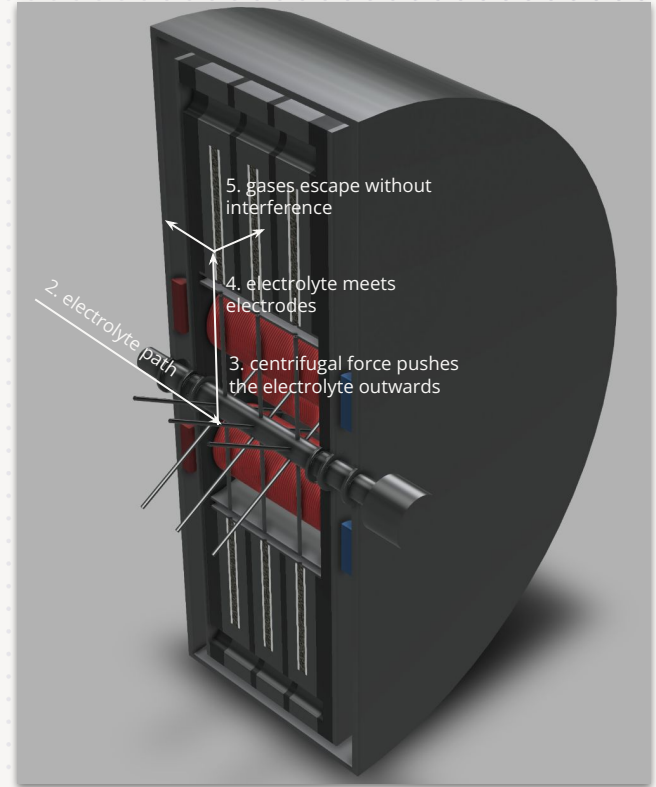
Step 3. As the device rotates, the suction generated by centrifugal force pumps the electrolyte through the system to and through the separators (membranes).

Step 4. The electrolyte is always in contact with the electrodes.

Step 5. Oxygen and hydrogen escape through the porous electrode material not interfering with the electrolysis process.

Step 6. Hydrogen is collected through the shaft and oxygen is released to the atmosphere.

The electrodes are powered by an embedded electric generator (marked in red in the image).



Turbine- integrated

Our entire hydrogen production process fits into the nacelle of a turbine.

