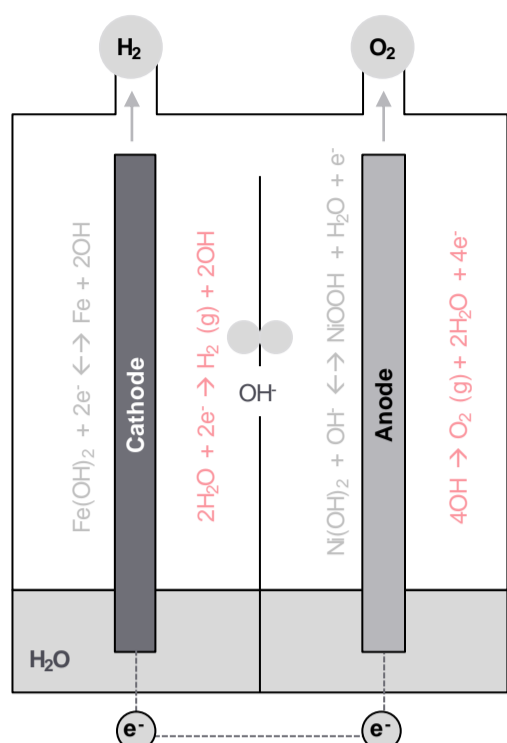


BATTOLYSER

Pioneering dual-purpose energy storage solutions

Battolyser Cell: How It Works

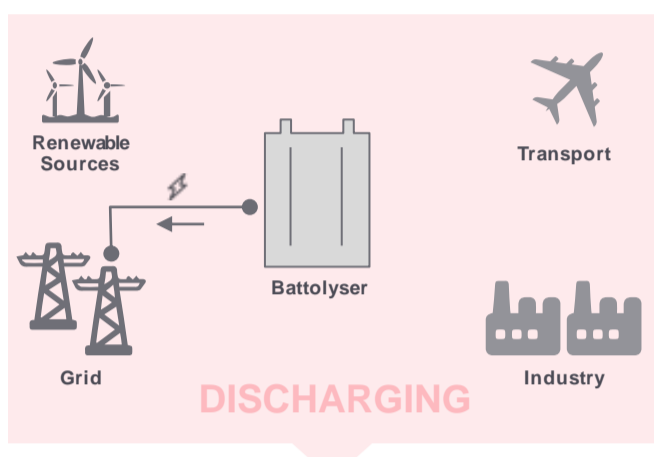
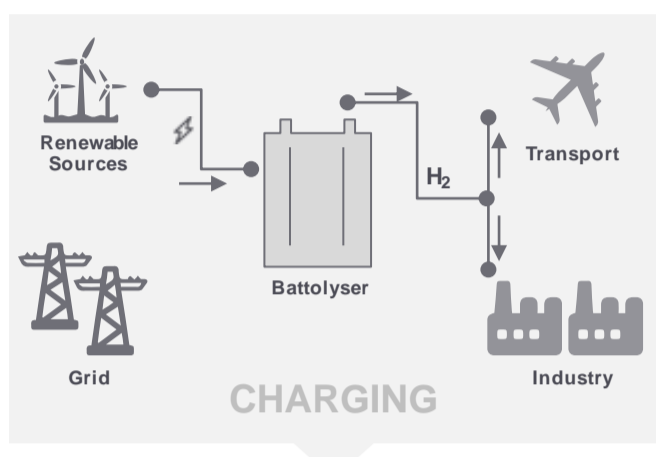


BATTOLYSER CELL

Battery + Electrolyser → Battolyser

The Battolyser is an innovative rechargeable electrochemical cell that serves a dual purpose. It can store electrical energy like a traditional battery and also act as an electrolyzer to produce hydrogen during excess energy or generate electricity for the grid during energy deficits.

The Battolyser cell takes inspiration from Thomas Edison's nickel-iron battery design.



During charging, the cell operates like a battery, storing electrical energy. Once fully charged, it automatically functions as an electrolyzer, producing green hydrogen via water electrolysis within the same cell. This hydrogen can then be stored or utilized in industries or transportation.

When renewable energy is not being produced, the battolyser instantly stops producing hydrogen and discharges the stored energy to the grid.

History of Battolyser

1901 Waldemar Jungner and Thomas Edison developed the first commercial Ni-Fe battery, initially used for powering electric cars.

2016 The patented design laid the groundwork for TU Delft's modern battolyser, which focuses on stimulating hydrogen production from this robust battery design.

2018 Dutch startup Battolyser BV, in collaboration with TU Delft and Proton Ventures, aimed to advance the technology by deploying a 10kW pilot system for a consortium.

2020 Battolyser Systems integrates nickel-iron electrodes with alkaline electrolysis, offering a 20-30-year lifespan. The startup focuses on scaling up to MW capacity and commercializing the technology.

2023 The first industrial-scale battolyser is now operational at the RWE Magnum power plant. The Battolyser System aims to reach a capacity of 100 MW by 2025 and 1 GW by 2030.

**TRL - Technology Readiness Level*

Comparison with Standalone Technologies

CAPEX | Battolyser offers cost advantages by integrating two functionalities into a single system at a price lower than that of two separate systems

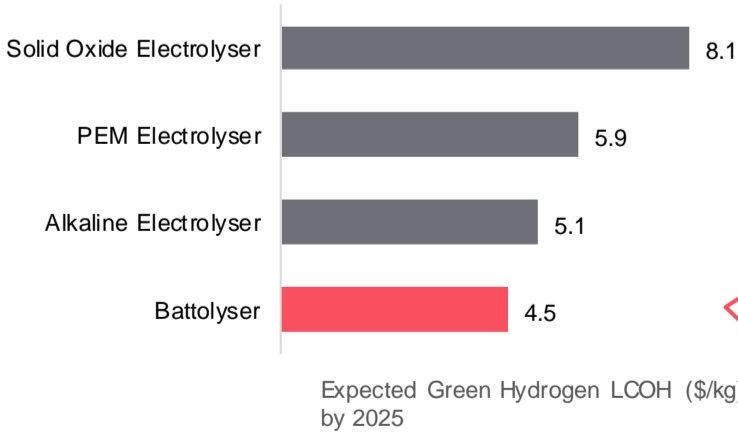
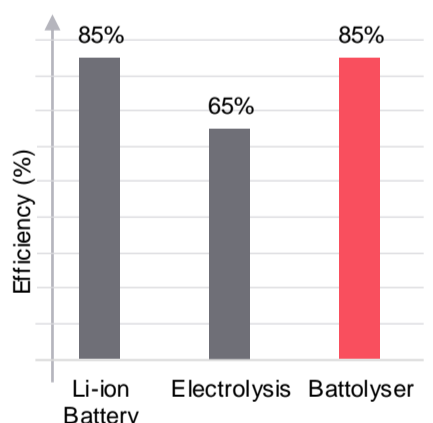
Lifetime | With an estimated lifespan of 20-30 years, Battolyser boasts a highly robust battery compared to Li-ion batteries (typically lasts 10-12 years)

Utilization | Battolyser excels in variable power production due to its over-charging capabilities and excellent battery reversibility, ensuring a high degree of utilization

Efficiency | It achieves high overall combined efficiency, averaging approximately 80-90%

Materials | Battolyser utilizes abundantly available materials such as nickel and iron, in contrast to Li-ion batteries, which often rely on cobalt

LCOH | Battolyser is anticipated to generate green hydrogen at a lower cost compared to conventional electrolysis technologies such as PEM or Alkaline electrolyzers.



The Battolyser produces green hydrogen exclusively during periods of excess electricity prices are low. Conversely, when electricity prices surge, the Battolyser discharges surplus energy into the grid.

The Battolyser outperforms Alkaline or PEM electrolysis with higher efficiency, employing affordable and readily available materials like Nickel and Iron for electrodes, instead of noble precious metals such as Platinum or Iridium.

Conclusion

- The Battolyser concept offers a potentially **simpler** and **more efficient** way to store energy and produce hydrogen by combining battery and electrolysis functions. This could improve renewable energy integration and potentially outperform existing technologies in terms of efficiency
- However, Battolyser technology is in its **early stages** with limited information about its true performance and cost. Extensive research and development is needed to compete with established systems like PEM and SOEC electrolysis
- Continued research, performance verification, and collaboration between developers and industry players are crucial for the Battolyser's future. If successful, it has the potential to offer a **significant leap forward in integrated energy storage and clean hydrogen production**.

About FutureBridge

FutureBridge is a techno-commercial consulting and advisory company. We track and advise on the future of industries from a 1-to-25-year perspective to keep you ahead of the technology curve, propel your growth, identify new opportunities, markets and business models, answer your unknowns, and facilitate best-fit solutions and partnerships using our platforms, programs, and access to global ecosystems and players.