ELECTRICON

ELECTRICON's patented technology provides a breakthrough solution for smaller-scale (<100 kt/yr) point sources, maritime CO_2 capture, and others. The process consists of our "Electrolyzer with benefits" producing O_2, H_2, acid, and base. The base is pumped to a point source where scrubbing of CO_2 occurs, forming bicarbonates, without requiring prior gas cleaning. The resulting bicarbonate stream is brought in a vessel, which, after closing off, is supplied with the electrolyzer's acid. The release of CO_2 is instant, leading to a more than 95% recovery of CO_2 gas at a pressure of 35 bars without a compressor. Compression on a small scale represents up to 40% of capture costs[1], making this a major advantage. After release, the electrolyte can be cleaned if needed, after which it goes back to the electrolyzer. ELECTRICON thus (i) avoids gas pipelines (ii) limits the installation at the point source to scrubbing (iii) avoids pressurization which entails high costs at smaller sites, both in terms of CAPEX and OPEX (iv) creates pure CO_2 gas (v) avoids risks to electrolyzer by impure carbonate streams and (vi) creates H_2, O_2 and heat as other products that can be monetized.

Electricon

TECHNICAL ASPECTS (all % are volume-based)

Point sources: All sources.

CO_2 concentration: > 400 ppm

The input CO_2 concentration goes from the atmospheric to the highly concentrated range due to the use of caustic scrubbing.

CO_2 capture efficiency: > 95%

CO_2 purity: > 95%

Min. feed gas pressure: 1.5 bar

Max. feed gas temperature: ±80°C

Typical scale: Small (<100 ktCO_2/yr)

Disclosed markets: point sources and maritime.

Primary energy source: Electricity

Impurity tolerance: Highly tolerant to impurities as a treatment post-recovery of electrolytes. SOx and NOx are beneficial impurities.

FUNCTION IN CCU VALUE CHAIN

- Capture of CO_2 from sources where amine scrubbing is not attractive, with classic caustic scrubbing.
- Pressurized, pure CO_2 delivered for CCS or CCU with formed H_2.
- No purification is needed before scrubbing.

LIMITATIONS

- Insufficient H_2 production for full CO_2 conversion to products.
- Not suited at present for a very large scale (Mton).
- Early-stage development.

ENERGY

- Only electricity input for the capture and regeneration process, to drive the electrolyzer and scrubber.

CONSUMABLES

- Water as per H_2 produced.
- Salts for electrolytes in case a purge is needed.
- Reagents for purification on site (e.g., oxidants).

Energy and Consumables

Parameter	Value (range)
Water (t/tH_2)	9*
Electricity (kWh/tCO_2)	670**

**Water required for H_2 production.*
***Electricity for the electrolyzer CO_2 component, Electricity for the scrubber depends on the stream, No electricity is needed for regeneration.*

COSTS

CAPEX: ± 510 €/tCO_2/yr*

Main CAPEX: Electrolyzer.

OPEX: < 100 €/tCO_2**

Main OPEX: electricity.

CO_2 capture cost: Variable.

Depends on the scale and the electricity price.

**At a small scale, even lower at 100 kt scale, but this is to be further developed.*

***OPEX cannot be considered on a pure CO_2 basis, the system consumes 32 GWh to capture 15 ktCO_2, produce 430* *tonnes of H_2, produce heat that can save another 1 kt-CO_2, produce oxygen, and it avoids pressurization costs and the need for gas purification. At a present 110 €/MWh industrial electricity price, one could state the OPEX at less than 100 €/tCO_2, including the pressurization to 35 bar.*

CO_2 avoidance cost: Not available

ENVIRONMENTAL

CO_2 footprint: Not available.

This cannot be stated as the number is just linear with the footprint of electricity needed. It would be too simple to just rely on solar or wind as the source and report a negligible footprint.

Spatial footprint: Standard electrolyzer size (±500 m^2 per MW installed capacity) + scrubber (±200 m^2 for 10 kt p.a. spoke).

Environmental issues: Not available.

ENGINEERING

Maturity: Individual (TRL 6-9); Combination (TRL 4)

Time to market: 2-3 years.

Retrofittability: Feasible

Easily retrofittable to current scrubbers.

Scalability: High

Scalable as H_2 electrolyzers.

Process type: Liquid solvent-based with chemical reactions.

Deployment model: Centralized or Decentralized.

Decentralized CO_2 absorption at point sources with centralized desorption.

Technology flexibility: Hybridization with other capture technologies is feasible.

TECHNOLOGY PROVIDERS

- ELECTRICON

MISSING INFORMATION

All technologies should be benchmarked at realistic energy prices and full costs (including compression). The costs for CO_2 capture are estimated to increase power production costs from €204 to €609 per MWh due to the impact of compression, where compressors require >40% of OPEX.[1] Technology is novel, hence information is needed on the impact of impurities and the optimal business model. Current competitors assume optimistically that they will get electrical or other energy below 100 €/MWh, which skews the business case.

BENCHMARK or ALTERNATE PROCESS

- Electrochemical DAC by **Mission Zero**.
- ICO_2CH system by **VITO**.
- Electrochemical DOC system **SeaO_2**.

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PARTNERS

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