



# ENERGY-INTENSIVE INDUSTRIES ECOSYSTEM: ELECTROLYSERS

## DEFINITION

Electrolysers are defined by the EU as devices that use electricity to split water into hydrogen and oxygen. This process is a key component in the production of renewable hydrogen, which the EU emphasises should be produced from renewable energy sources to ensure at least 70% greenhouse gas emissions savings compared to conventional hydrogen production methods.

Electrolysers thus offer a solution for significant CO<sub>2</sub> emitters to mitigate their carbon dioxide emissions through a process known as “electrolytic carbon capture and utilisation” (eCCU). There are different electrolysis technologies, with alkaline electrolysis, proton exchange, membrane (PEM) electrolysis, and solid oxide electrolysis cells (SOECs) prominent ones.

## SME SIGNIFICANCE

A complete overview of relevant actors within Europe is missing, leading to imprecise estimates based on data from only a few Member States. No data by firm size could be found. Interviews indicate a strong presence of smaller companies especially in the more novel technologies.



### NUMBER OF SMEs IN THE EU27 VALUE CHAIN

ca. 1,400

### SHARE OF SMEs OVER TOTAL

80%



### EMPLOYMENT BY SMEs

ca. 18,000

### ADDED VALUE OF SMEs OVER TOTAL

40%

# ELECTROLYSERS EU VALUE CHAIN

## PHASE 1

### INPUTS AND RAW MATERIALS



- Inputs that are in short supply for electrolyser production include rare earth metals like platinum, iridium, and ruthenium used as catalysts for electrodes, titanium for construction due to its corrosion resistance, membrane materials with high conductivity for PEM electrolyzers, nickel for electrodes in alkaline electrolyzers, and carbon fibre for structural reinforcement.
- The EU is, to a large extent, dependent on third countries.

## PHASE 2

### INTERMEDIATE PRODUCTS



- There is a relatively well-developed market for electrolyser components in the EU.

## PHASE 3

### FINISHED PRODUCTS



- The EU is largely self-sufficient in the internal production of electrolyzers.
- For both finished products and intermediate ones, the dependence on outside countries, in particular China, is most pronounced when it comes to alkaline electrolyzers.

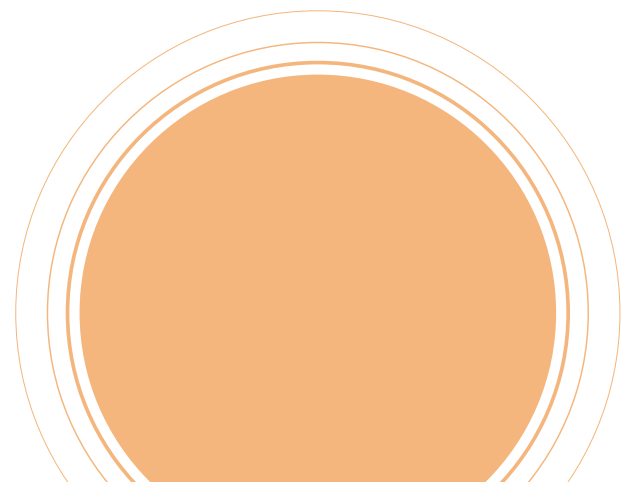
# STRENGTHS AND VULNERABILITIES

## EU STRENGTHS

- The EU27 counts for around 20 to 30% of global electrolyser production, depending on the estimate. Other estimates are more favourable. In Europe, there is a **robust presence of electrolyser manufacturers** ranging from major industry leaders to smaller actors.
- EU companies benefit from strong research facilities across the region. Currently, Europe **leads in technology innovation**, holding about 40% of patents in the field, with a particularly strong position in PEM technology, as well as the more experimental high-temperature electrolysis.
- There is ample **opportunity for SMEs to scale**, with a large number of start-ups outgrowing the “SME status”.

## EU VULNERABILITIES

- Alkaline electrolysers, the most mature technology, are dominated by **Chinese** producers that enjoy a considerable **price advantage**. The production capabilities are expected to rise sharply in China, which is likely to lead to even stronger competition.
- Competitors from the **USA are also closing the gap**. The US Inflation Reduction Act is attracting additional investment towards expanding manufacturing capabilities.
- The EU is very **dependent on critical inputs**. Any rupture in supply would damage local producers, especially smaller ones.





# EXAMPLES OF POLICY MEASURES INTRODUCED TO ENHANCE OPEN STRATEGIC AUTONOMY


## EU


- Policies related to the development and deployment of electrolyzers are typically part of broader schemes to develop (green) hydrogen. The **Important Project of Common European Interest** (IPCEI) in the hydrogen technology value chain is a case in point.
- Within the EU, the **Repower EU Plan**, which builds on the Hydrogen Strategy, sets targets of electrolyser capacity in 2024 and 2030.
- In 2022, a **Joint Declaration** was signed between Commissioner Breton and 20 industry CEOs, outlining an agreed target by electrolyser manufacturers in Europe to increase their manufacturing capacity by tenfold to 17.5 GW per year. It also includes Commission actions aimed at establishing a supportive regulatory framework, facilitating access to finance, and promoting efficient supply chains.

## MEMBERS STATES

- **Spain:** It has set particularly ambitious targets. In October 2020, the Ministry for Ecological Transition and the Demographic Challenge approved the “Hydrogen Roadmap: A Commitment to Renewable Hydrogen”. The roadmap defines 60 specific measures, including: regulatory, sectoral (including better data and connections between different actors of the value chain, including public research centres such as the National Hydrogen Centre), financial incentives and public funding for the development of large-scale projects, and the promotion of R&D. The role of the National Hydrogen Centre as a leading public R&D centre will be strengthened as part of this strategy.
- **The Netherlands:** The Dutch government is consulting on a new initiative to encourage climate technology manufacturing, including a significant subsidy programme. This programme offers up to EUR 50 million per company for investments in electrolyser production facilities. The subsidy would cover 15% of eligible costs for manufacturing critical components for green hydrogen projects. If the factory is located in a region approved for EU regional aid, the support increases to 20%. Additionally, the subsidy rate rises by 20 percentage points for small companies and by 10 points for medium-sized enterprises.

## EXTRA-EU

- **UK:** It adopted its Hydrogen Strategy in 2021. It outlines the government’s plan to develop a hydrogen economy as part of its efforts to achieve net-zero carbon emissions. It focuses on utilising hydrogen as a clean energy source for various sectors, including industry, transportation, and heating. The strategy includes initiatives to produce low-carbon hydrogen, establish hydrogen production hubs, invest in research and development, support hydrogen infrastructure, and promote international collaboration. It aims to unlock the potential of hydrogen to decarbonise the economy and address climate change while creating new economic opportunities and supporting job growth. Electrolytic production plays a major role in this strategy, with plans to move from small-scale facilities to ever-production at critical mass.
  - **USA:** In 2022, the USA introduced significant incentives under the Inflation Reduction Act (IRA), including a tax credit to support manufacturing projects. These measures are showing positive outcomes, with a noticeable uptick in the establishment of new electrolyser manufacturing facilities across the nation.
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# POLICY RECOMMENDATIONS TO MAXIMISE SME OPPORTUNITIES AND REDUCE RISKS IN OPEN STRATEGIC AUTONOMY

Develop the **evidence base**, ideally by firm size.

One recommendation is to “**connect the dots**” **within the eco-system**, and that is the goal of the Electrolyser Partnership as part of the European Clean Hydrogen Alliance. This plans to unite electrolyser manufacturers and suppliers of components and materials within the alliance’s current framework. Financial institutions, including the European Investment Bank, will be encouraged to join and participate in this partnership, as well as research organisations and universities. One caveat is that such partnerships should involve SMEs to the extent possible and should try to actively reach out to relevant small companies.

Develop **partnerships with third countries** for raw materials to ensure a stable supply. Small manufacturers would likely be in a particularly difficult position to secure access in case of supply chain disruptions.

European electrolyser manufacturers pledge substantial investments in **R&D and innovation**, collaborating with both private entities and academia. The Commission and its Member States can play a crucial role in support of these activities. Research programs like the Horizon Europe Clean Hydrogen Partnership are crucial in this respect. Again, SMEs should not be overlooked in these endeavours.

Co-investment schemes, public-private partnerships, tax breaks for equity investors, loan guarantees and so on, seem necessary to realise the ambitious targets for the electrolyser industry. For this specific value chain, the **European Investment Bank** (EIB) could potentially step up efforts to underwrite loans for electrolyser manufacturers.

The possibility of introducing “**Made in Europe**” **local content requirements** should be explored to shield the domestic industry from less expensive Chinese imports, which benefit from substantial subsidies. This may be helpful towards smaller EU firms, as they are in direct competition to act as suppliers for large companies.

Resolve persistent gaps in the **regulatory framework** and increase the speed of implementation of existing projects, which are especially important for smaller firms.

## Data sources:

[https://ec.europa.eu/commission/presscorner/detail/en/ip\\_22\\_2829](https://ec.europa.eu/commission/presscorner/detail/en/ip_22_2829)

<https://www.iea.org/energy-system/low-emission-fuels/electrolysers>

<https://ispt.eu/media/The-race-for-a-position-in-the-global-electrolysis-market-ISPT-FME-TNO.pdf>