

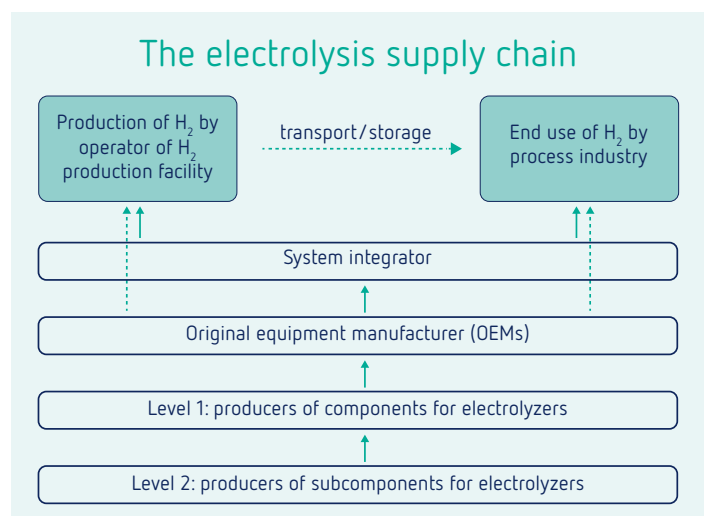
The race for a position in the global electrolysis market

The electrolysis market is one of the fastest growing markets of the energy transition, as water electrolysis is the key technology for producing green hydrogen. In particular it is expected to play a key role in the electrification and decarbonization of the process industry, where hydrogen will be relevant both as energy carrier and as feedstock. Current estimations predict a global installed electrolysis capacity of approximately 145 GW by the year 2030. This implies an incredible extensive expansion of the market where currently less than a gigawatt capacity is installed. It also represents a huge opportunity for the Dutch manufacturing industry to develop a strong electrolysis cluster and realise economic growth. In the vision of ISPT, collaborative development is key here. Together with TNO and FME, ISPT is developing plans to boost the development of technology for electrolysis within the Dutch manufacturing industry.

This article was created in collaboration with Lotte van der Velde, Roals Suurs (TNO), Jelle Blekxtoon (FME), Carol Xiao (ISPT) and Tony van Waveren (ISPT) | April, 2023

In the Netherlands, some 1000 companies¹ are involved in producing systems for production, storage or distribution of green hydrogen. About 150 of these are manufacturing companies, producing (sub) components for electrolyzers. A few companies assemble complete electrolyser systems, the so-called Original Equipment Manufacturers or OEMs. Most companies are located in three areas in the Netherlands²: the triangle Hengelo – Arnhem – Nijmegen (with companies such as Teijin, Veco and MTSA); the high-tech region of Eindhoven (VDL, SALD, Hauzer and Ionbond); and the Randstad (PlugPower/Frames, Magneto, DelftIMP DotX Control³). Although 150 might already sound like a lot, the branch is still in its infancy. Many companies originate from other branches and are still exploring how to put their expertise to use in the electrolyser value chain. Besides, the electrolyzers produced by Dutch OEMs are still below megawatt capacity where other European companies are already delivering large-scale electrolysis systems.

Even so, as project manager Tony van Waveren of ISPT points out, “the Dutch manufacturing industry has great potential to become a key player in the electrolysis market. It is already very high-tech oriented and innovative, which is exactly what is needed in this market. And many Dutch manufacturers already possess knowledge and expertise that is relevant to electrolyser production.” Jelle Blekxtoon, business development manager at FME, points out that, for instance, there’s common ground between the chlor-alkali industry and water-electrolysis, and between fuel cells and electrolyser development and production. “The already available expertise is instrumental in accelerating the scale-up and production of electrolysis systems”, he says. An inventory by FME and TNO² confirms that the entire electrolyser supply chain is already present in the Netherlands. The question therefore is not if the Dutch



1 See Routekaart Waterstof by Nationaal Waterstof Programma. *Chapter 13: Thema Maakindustrie*. [Routekaart Waterstof \(nationaalwaterstofprogramma.nl\)](https://www.routekaartwaterstof.nl/)

2 See *Kansen voor de Nederlandse Maakindustrie by TNO and FME* <https://publications.tno.nl/publication/34637401/7XsSOW/TNO-2020-elektrolyzers.pdf>

3 The examples of companies part of the supply chain of electrolysis development are all part of the HyScaling project

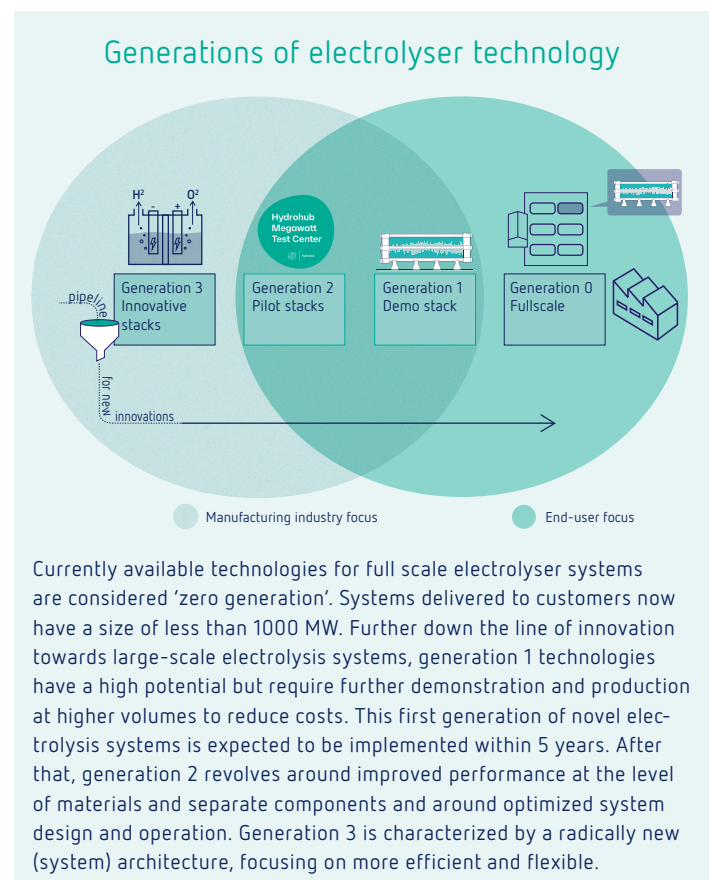
manufacturing industry is capable of entering the global electrolysis race, but how to activate its potential⁴.

This is the starting point for the concerted action ISPT proposes to accelerate the further development of the Dutch manufacturing industry in close cooperation with TNO and FME. It builds on the joint efforts already being made in the [Hydrohub Innovation Program](#) of the ISPT hydrogen cluster, in particular the HyScaling program that is managed by Van Waveren. And as the Dutch National Hydrogen Program also acknowledges in its recently published Roadmap Hydrogen¹, timing is crucial. The Dutch industry needs to jump in as soon as possible in the race for a position in the global electrolysis market. Says Roald Suurs, researcher at TNO Strategic Analysis & Policy: “To meet the energy transition challenge, mass manufacturing of electrolyzers has to start now! At the same time, their design needs to be improved on a fundamental level, from the basic materials to the components and the entire system architecture.”

Collaboration benefits competition

To ISPT, intensified collaboration within the industry is key. The aim is to create meeting places for partners across the value chain, connecting the manufacturing industry and end users. Think about platforms, projects and partnerships. The ISPT HyScaling project provides an existing example of this collaborative approach. It involves 28 partners from the manufacturing industry and end users, working together on hypothetical but realistic situations, so-called use cases. These provide realistic examples of how hydrogen is produced, and what requirements are relevant given a specific context. Another example is the Elektrolyser Makers Platform (EMP-NL), an initiative from TNO and FME, connecting companies within the manufacturing industry. Roald Suurs, researcher at TNO Strategic Analysis & Policy, points out that the manufacturing industry is somewhat fragmented and needs an organizational transition: “Through collaboration we can aggregate the perspectives and interests of the manufacturing industry, so that there is a common vision and a common voice.”

The importance of intensified collaboration is in particular underpinned by an assessment of electrolyser technology development. Three future generations of electrolyzers can be distinguished, all representing substantial improvements with respect to the current state-of-the-art (see figure). In particular when it comes to development of the higher generations, the process is hampered by a communication gap between the manufacturing industry and the end users; end users requiring high volumes of hydrogen are mostly in the petrochemical process industry. Adding to this, the two sectors have a different ‘rhythm’ for testing and introducing new developments. According to Carol Xiao, director of business development at ISPT, the “modus operandi” of the manufacturing industry is product development based on a distinct order. Starting from a list of specifications it starts



⁴ Recently, TNO / VoltaChem published the discussion paper *Electrolysers: opportunities for the high-tech manufacturing industry* (March 2023)

innovating, testing, producing and eventually delivering. This might take up to two years. In contrast, the core business of the process industry is process development which can easily take ten years or more. As a result, system requirements such as safety standards, hydrogen quality, or maintenance parameters trickle down rather slowly the supply chain of electrolysis system integrators, OEMs, electrolyser stack producers and (sub)component producers. In view of a fast energy transition and the desire to secure a position in the global electrolysis market, this needs to be accelerated significantly. So the process industry and manufacturing industry have to find each other and, as Tony van Waveren puts it: “They need to partner up and synchronize their rhythm”.

Partnerships are also useful to set-up test and demonstration facilities. ISPT, FME and TNO are already co-operating to support initiatives for realising such facilities at different scales. Jelle Blekxtoon mentions: “Most testing facilities are currently used for research. They need to be open for the industry to test its innovations. This is a crucial element in the production cycle to reach a commercial level.”

Another crucial aspect is that the Dutch manufacturing industry needs a leader, preferably an OEM, who can start a collaboration with companies who produce smaller components. The OEM would have the resources to bring smaller Dutch companies to a next level, by collaborating and validating their technologies.

Creating a favourable hydrogen ecosystem

Collaboration thrives best in a favourable climate. According to Carol Xiao: “The manufacturing industry needs stimuli and a clear direction”. The roadmap Hydrogen¹ is an important first step, but the manufacturing industry also needs incentives and barriers have to be taken down. As Jelle Blekxtoon comments: “There is no point in denying that the Dutch manufacturing industry is a bit in the shadow of the bigger companies. Therefore subsidies should be feasible and accessible for start-ups and SME’s, so they can receive financial support and boost their new innovative technologies to a competitive level”. Another example of a stimulus is to prioritize Dutch companies within tendering projects. And as end users are currently receiving the first subsidies for hydrogen production factories, why not choose to involve the Dutch manufacturing industry within those projects? Furthermore, shortening the legal procedure for the construction of hydrogen production factories would be a positive signal towards all actors in the electrolyser supply chain that the Netherlands is firmly supporting the hydrogen transition. Finally, TNO, FME and ISPT emphasize the importance of the creation of educational centres and testing facilities where the manufacturing industry can validate new technologies.

We need sprinters and marathon runners

In the race for a position in the electrolysis market we need both sprinters and marathon runners. Sprinters, to realize a fast implementation of electrolysers that cater to the need of the Dutch process industry for decarbonisation and that support local and regional initiatives as part of the energy transition. And marathon runners that develop second and third generation electrolysers, ensuring a noteworthy position of the Dutch manufacturing industry in the global electrolysis market. Achieving these objectives requires collaboration throughout the electrolyser supply chain in combination with a favourable climate. And ultimately, the real winners will not be technologies or companies. The human generations to come will win the true prize.

