

PART ONE | Hydrogen electrolyser consolidation: The wave reshaping the industry

By [Stephen B. Harrison](#) on Jan 29, 2025

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There is a black hole of consolidation out there, beginning to suck all things related to hydrogen electrolyser value chains into it.

Horizontal and vertical integration within electrolyser production and deployment will accelerate towards the end of this decade. When several of the larger dominoes topple in rapid succession, it will rapidly escalate into a race to the finish line.

We may find that we are 80% through this consolidation play by 2030.

Good for innovation

Fresh finance for speculative innovation will likely become more scarce and increasingly expensive. The wave of buy-side venture capitalist (VC) investor interest from the past five years is likely to shift to private equity (PE) consolidation plays and other value-seeking deals.

The next wave of high-value electrolyser-related transactions will be focused on optimising the value of what has been achieved over the past 10 years and what is currently in the process of being commercialised.

This may be exactly what the hydrogen electrolyser sector needs. There will inevitably be rising costs of innovation as electrolyser technologies mature and developments will therefore need to be proven at an ever-larger scale to demonstrate long-term competitiveness and bankability.

Also, the cost of development and growth capital in this space will increase due to higher perceived risk and a more realistic expectation of returns. Rising interest rates in the background also play a role, in comparison to negative interest rates which prevailed during the hype years of hydrogen at this turn of this decade.

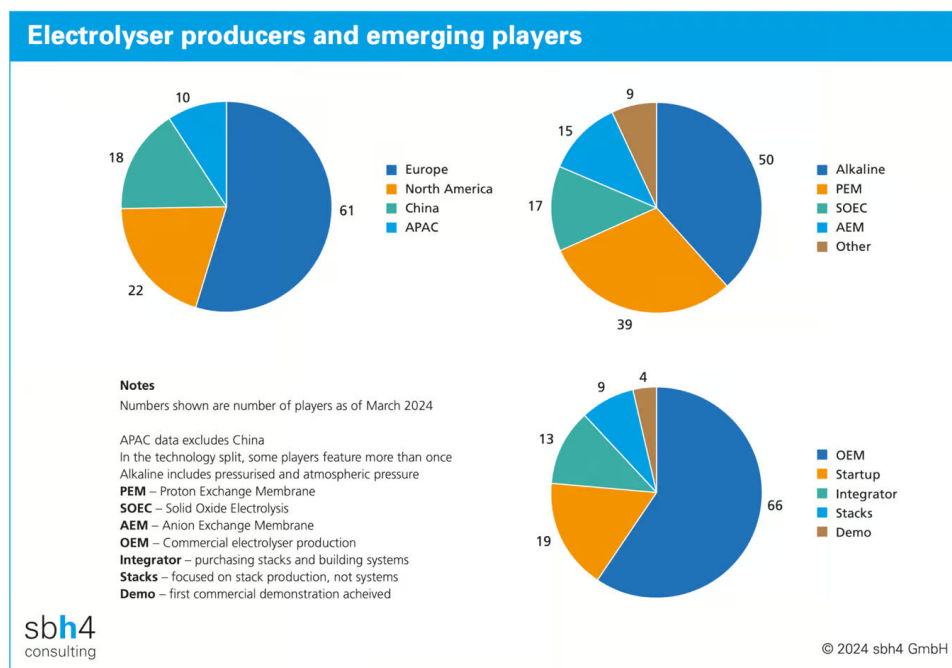
Fewer, bigger electrolyser value chain players with strong backing are essential for the next phase of hydrogen electrolyser innovation.

Thinning out

Many of the >100 stack builders, electrolyser system OEMs, and systems integrators will begin to merge, or take each other over. This is nothing new for the sector. Plug Power acquired Giner for More than \$60m in 2020. Sunfire acquired alkaline electrolyser technology from IHT in 2021.

Others may seek collaboration to pool resources and share development budgets. As Industrie DeNora and thyssenkrupp Industrial Solutions have done since 2001, and has continued through the 2022 IPO of thyssenkrupp nucera.

More and more players will fall by the wayside in the same way that AquaHydrex filed for bankruptcy and folded its alkaline electrolyser R&D efforts in October of 2023. After millions of dollars of investment equity, in the end only a few pennies were offered to an insolvency specialist for AquaHydrex's IP and R&D equipment.



Sharks waiting for the kill

Nel acquired Proton Energy Systems in 2017 to form what was, at that time, the world's largest electrolyser producer. The acquisition also meant that both PEM and alkaline electrolysers were available from one provider.

Recently, the tide has turned. Nel has announced a still-stand in stack production at its recently modernised production facility in Herøya, Norway. The most recent capacity upgrade at that location came onstream in 2024. The site boasts an electrode plating line and highly automated production of its atmospheric pressure alkaline electrolyser stacks.

On the other hand, the development of Nel's (yet to be launched) pressurised alkaline product range, to be produced in both Europe and the US, appears to continue unabated.

Will Nel be the first big name to fall victim to a 'buy and break' PE play? Will its PEM, atmospheric alkaline and new pressurised alkaline divisions be broken up? Will some product lines and production assets be wound down and others sold in different directions?

Or is Nel ripe to be taken over by a competitor? Or will it need to lay itself at the mercy of the insolvency court?

White knights

The next five years will not only be about shark attacks. There will be many constructive ways in which the electrolyser production and innovation space will converge.

International energy and chemicals sector EPCs who have been involved with electrolyser installation projects and enjoy a good reputation with a strong market presence may seek to take over electrolyser EOMs or stack builders.

At the end of the day, what they really need are stacks to integrate into projects. The balance of plant (BOP) around the stack is ultimately their bread and butter business and has been for decades.

Paul Wurth, a plant builder focused on the metals industry, was the lead investor in Sunfire's series C fundraising round in 2019. At that time, Sunfire was focused on solid oxide electrolysers and fuel cells.

A more recent example was the investment made by Austrian EPC player Andritz in HydrogenPro in 2023. An advantage to both parties was that Andritz could produce electrolysers in Europe to increase HydrogenPro's attractiveness to EU-funded projects.

Well-financed project developers may seek to protect their favoured electrolyser builders and bring them under their wing to secure the stability of their projects.

Copenhagen Infrastructure Partners (a major renewables project developer) partnered with Blue Earth Capital during Sunfire's 2022 Series D capital raise. As part of the investment, CIP secured access to 640MW of electrolyser production capacity to secure its Power-to-X project pipeline.

Diversified players will have the staying power

Cash-rich players with helpful parent companies, which have diversified revenue streams and deep wallets (Fortescue Zero, Siemens Energy, thyssenkrupp nucera) will have the upper hand as M&A deals come onto the table, or start-ups see that white knights offering rescue packages are the only way forward.

An example that leans in this direction is the investment that Longi made in HydrogenPro in 2024. Longi is an established solar panel producer with a leading product, strong cash flow and profitable business model. They have recently diversified into electrolyser production in China and have been involved in some of the largest electrolytic hydrogen projects.

Longi's gravitas in the renewable energy space means they can afford to invest where they believe in for the long term without the need for these newer interests to become profitable overnight.

Use it or lose it

Strategic investors with a history of smart involvement in this space have the opportunity to use and commercialise electrolysers. They may choose to double down on some of their favourite investments and bring them in-house. For example, Mitsubishi Heavy Industries joined Longi and Andritz in Hydrogen Pro's recent investment round.

In a similar combination of investors, Chart Industries, Larsen and Toubro and McPhy have an interesting three-way agreement. McPhy brings the electrolyser technology, Larsen and Toubro is a leading Indian EPC house with access to extensive manufacturing facilities. Chart seeks to future-proof its business model with access to clean tech that will support decarbonisation across multiple sectors. Will McPhy end up in the hands of one of these larger actors?

Posco, a major South Korean steel maker is a major investor in Hysata, one of Australia's leading electrolyser start-ups. Hysata, of all the innovators out there, has undoubtedly the greatest claim to be a mould-breaking pioneer with their bubble-free alkaline electrolyser technology.

Its unparalleled high efficiency results in stunningly low operating costs and its innovative design eliminates the need for many balance of plant items, reducing on-site installation complexity and equipment manufacturing costs.

Business maturity and typical decarbonisation investment characteristics

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Typical investor	Angel	Early stage VC	VC	Late stage VC/PE	Bulge bracket PE/Infra
Typical investment	US\$ 10 K – US\$ 250 K	US\$ 250 K – US\$ 5 M	US\$ 5 M – US\$ 50 M	US\$ 50 M – US\$ 200 M	US\$ 200 M – billions
Typical holding period	8 – 10 years	6 – 8 years	5 – 7 years	3 – 7 years	3 – 5 years
Targeted financial returns	> 75% IRR or +10x	> 60% IRR or +10x	> 40% IRR or +7x	-25 to 35% IRR or +5x	> 18% IRR or +3x
Financing stage and investment type	Initial raise, friends and family, angel investors	Seed capital, first institutional check	Growth capital, Series A to C rounds with full due diligence	Series C round to IPO with full prospectus	Majority control, debt leveraged
Typical technology maturity (TRL)	1 – 3	2 – 4	4 – 7	7 – 8	8 – 9
Example decarbonisation technologies	Developments of emerging and established technologies				

More mould breakers

Membrane-less electrolysers are also breaking with conventional thinking. But are they safe? Most safety systems dealing with flammable materials rely on avoiding two of the three point on the fire triangle: an

ignition source, a flammable gas and an oxidiser.

When hydrogen and oxygen are produced together as a gas mixture we have combined two elements of the fire triangle: there is no way to guarantee that an explosion will not take place. Electrostatic discharge inside the pipework may take place, even if good earthing practices have been implemented.

Breaking the mould is not about taking unnecessary risk to achieve a step change in performance. Safety must be prioritised as the innovations are screened through to higher maturity levels.

Will these membrane-free electrolysers and their innovators be sustainable? Will this be the first category of electrolysers to fall by the wayside?

Multiple incremental innovations

There is no single silver bullet behind Electric Hydrogen's ultra-high current-density PEM stack, which is beginning to break the PEM paradigm and challenge the reputation of PEM being an expensive technology choice. Their breakthrough has come at stack level from integrating a number of smart, synergistic innovations at component level.

Similar things can be said about Fortescue Zero's square pressurised alkaline stack, which has broken the trend for this class of electrolysers to be round. The high current density, which leads to its small size, is achieved through cumulative component-level innovations.

DeNora's new DRAGONFLY® pressurised alkaline electrolyser is also based on a rectangular stack. A key innovation here is in-cell cooling in the bipolar plate component. This de-couples thermal management from lye recirculation and lye cooling. This, in turn, reduces the lye recirculation rate which results in an associated reduction in the size, cost and parasitic power draw of balance of plant equipment.

Whilst these three players are all working on compelling ideas, there is no guarantee that these three technologies, which are unproven at scale with external customers, will enjoy commercial success.

If investor funding or parent company patience runs out before the big orders are signed, these product lines may be cut or the innovations sold on for others to deploy.

As the consolidation wave takes hold, the survival of key players will depend on strategic alliances and access to capital, setting the stage for the next phase of electrolyser innovation.

Throughout the thinning-out process, conducting due diligence to objectively assess the potential and risks of any deals that are out there to be made will be essential.

Find out what the strategic plays for the next phase of electrolyser-making could be as the consolidation survivors look to find their USP.

Read Part Two [here](#).
