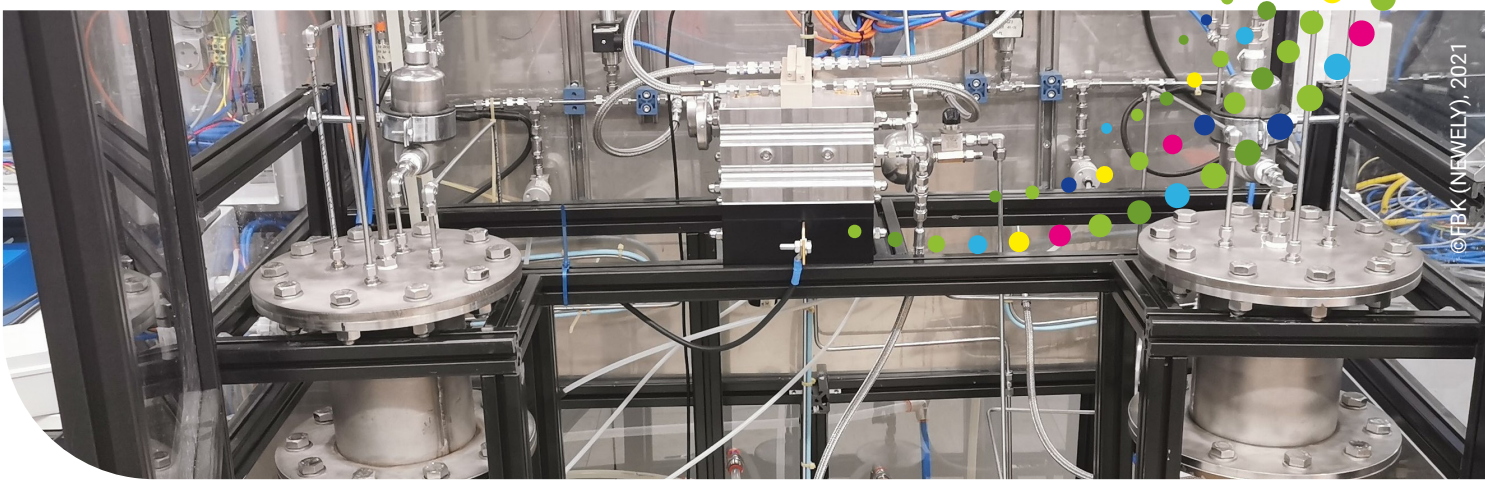
Clean Hydrogen Partnership

Hydrogen Production

New electrolysers to generate cheap, clean hydrogen



Three Clean Hydrogen Partnership-funded projects have expanded the knowledge base related to development of anion exchange membrane electrolysers (AEMELs) for hydrogen production in Europe, testing small power stacks with a capacity of 2 kilowatts (kW). The projects have also jointly defined AEMEL testing protocols and established AEM-HUB, an information-sharing cluster.

Combining advantages, eliminating drawbacks

AEMELs are at the early research and development stage, whereas high-capacity proton exchange membrane (PEMELs) and alkaline (AELs) electrolysers are commercially available. However, PEMELs require expensive catalysts and AELs operate at low current densities, reducing efficiency.

AEMELs have the potential to combine the advantages and eliminate the drawbacks of AELs and PEMELs as regards cost, effectiveness and sustainability of hydrogen generation. Three complementary projects – ANIONE, CHANNEL and NEWELY – have increased knowledge of hydrogen production catalysts and AEMEL components, including reinforced composite membranes and low-cost, durable electrodes. The components were assembled into stacks and tested for around 2 000 hours.

Upscaling and marketing

The materials and stacks developed by ANIONE, CHANNEL and NEWELY have achieved efficiency levels close to those of PEMELs, but at lower cost. The membranes show enhanced mechanical behaviour and the catalysts demonstrate higher performance and stability than their state-of-the-art equivalents.

All three projects have now concluded, and consortia members are looking to scale up the stacks to reach capacities of up to 100 kW within new Clean Hydrogen Partnership-funded projects like HERAQCLES and HYSCALE. SME partners subsequently plan to commercialise elements such as the membranes, electrodes and stacks.

COST-EFFICIENT, SUSTAINABLE, AVAILABLE

Anion exchange membrane electrolysers (AEMELs) offer the possibility of being energy efficient for a lower cost than current commercial electrolysers, but more work is needed before they are ready for market.

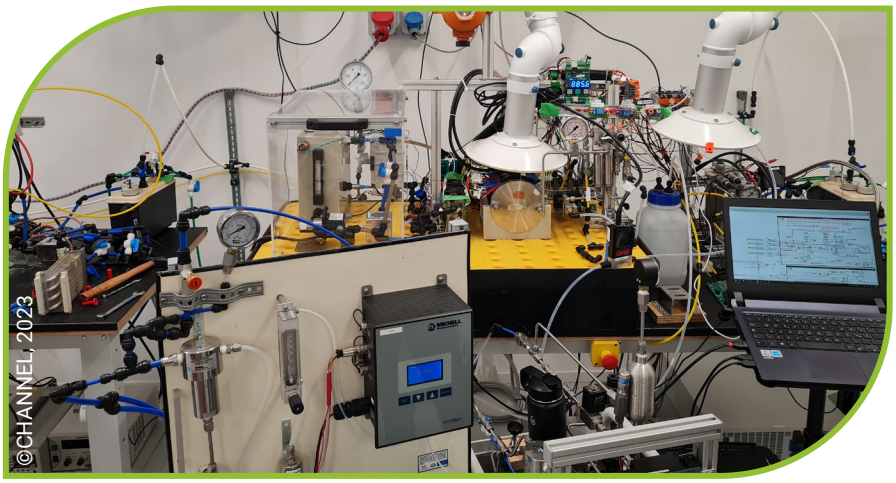
COLLABORATION IS KEY

As anion exchange membrane electrolysers can make hydrogen production cheaper, more effective and more sustainable, Clean Hydrogen Partnership projects are paving the way for wider implementation of this technology.

Given their complementary objectives, ANIONE, CHANNEL and NEWELY tackled AEMEL development in a collaborative way, exchanging information to formulate the testing protocols and create the hub. Testing provided relevant results for upscaling and optimisation.

The goal? Future projects should create high-capacity AEMELs that can produce cost-efficient, clean hydrogen at large scale for use in applications such as grid balancing, energy storage, industry and transport.

Key results? The projects increased knowledge of AEMEL catalysts, reinforced membranes and low cost and durable electrodes for AEMEL. The composite membranes developed by the project and the setting up of the AEM-HUB provides a basis for further AEMEL development. The projects also jointly came up with testing protocols for AEMEL in collaboration with the European Commission's Joint Research Centre.



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KEY ACHIEVEMENTS

NEW MATERIALS AND COMPONENTS
for AEMEL electrolysers were validated in 2 kW AEM electrolyser stacks with 5 to 10 cells each

58% EFFICIENCY
achieved by stacks

ENERGY CONSUMPTION
was below 57 kWh/kg H2

UP TO 40 % LOWER COSTS
than PEMELs

NO CRITICAL RAW MATERIALS
used, unlike in PEMELs

1.8 VOLTS
generated per cell – close to PEMEL performance levels

ZERO VOLTAGE DEGRADATION
in 2 000 hours of operation

IMPACT

Other projects such as HERAQCLES and HYSCALE **HAVE SCALED UP TO STACKS** of a few tens of kW and developed large-size cells.

Some of the SME partners plan to **COMMERCIALISE THE MATERIALS** developed in the projects after upscaling.

The AEM-HUB was established to **SHARE INFORMATION** on AEMELs.

TESTING PROTOCOLS
were shared with the EU's Joint Research Centre.

Clean Hydrogen Partnership

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