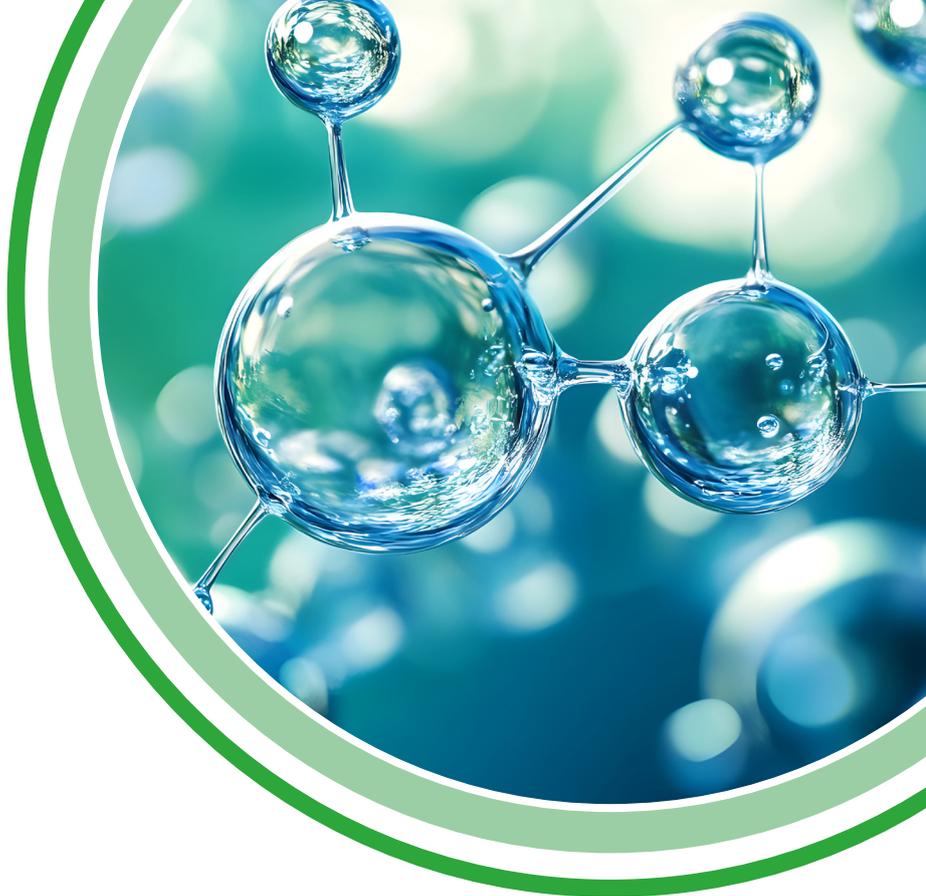




News & updates | Published article

Over the past six months, the ADVANCEPEM Consortium has achieved significant milestones in the development of high-pressure PEM electrolyser. Large-scale MEAs have been successfully produced, the short stack has undergone extensive testing, and the full-stack assembly is now underway. These advancements mark a critical step toward delivering an efficient 50 kW demonstrator for high-pressure hydrogen production. Partners are now focused on the next major goal: passing the second technical review at the end of the second reporting period. This review will validate progress and set the stage for final integration and demonstration.



UPCOMING EVENTS

- **5th-7th May 2026 (Montpellier, France):** 10th International Conference on Fundamentals & Developments of Fuel Cells and Electrolyzers (FDFC 2026). Antonino S. Arico, director of CNR-ITAE, will present the latest findings on short-side-chain proton exchange Aquivion(R) membranes containing Ce-radical scavenger for water electrolysis at high current densities

UPCOMING DELIVERABLES

D6.1 – Electrolyser manufactured and delivered (M39)

Manufacturing of large-scale MEAs

The development of large-scale Membrane Electrode Assemblies (MEAs) has been a cornerstone of recent progress in ADVANCEPEM. IRD successfully manufactured 10 large MEAs for the initial short-stack assembly, using advanced materials supplied by CNR-ITAE (catalysts) and SYENSQO (ionomer and membrane). These MEAs were tested following harmonized characterisation protocols defined by the Joint Research Centre (JRC-IET) and adapted for ADVANCEPEM, ensuring consistency and reliability in performance evaluation. Building on this success, IRD completed the production of an additional 60 MEAs for the full-stack assembly, which will power the 50 kW demonstrator. The insights gained from Deliverable D5.2 have been instrumental in optimising MEA design for efficiency, durability, and safety under high-pressure conditions. By combining cutting-

edge materials with rigorous testing protocols, the consortium is laying the foundation for a new generation of PEM electrolysers capable of operating at pressures up to 200 bar, a critical requirement for industrial hydrogen applications.



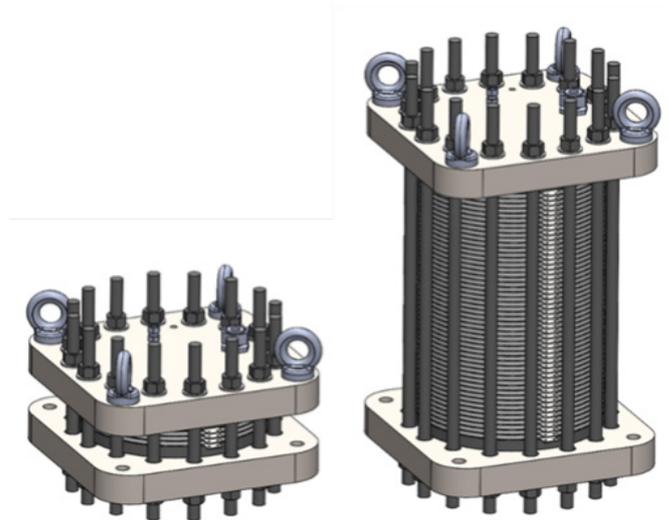
10 IRD large-scale MEAs supplied to Oort.

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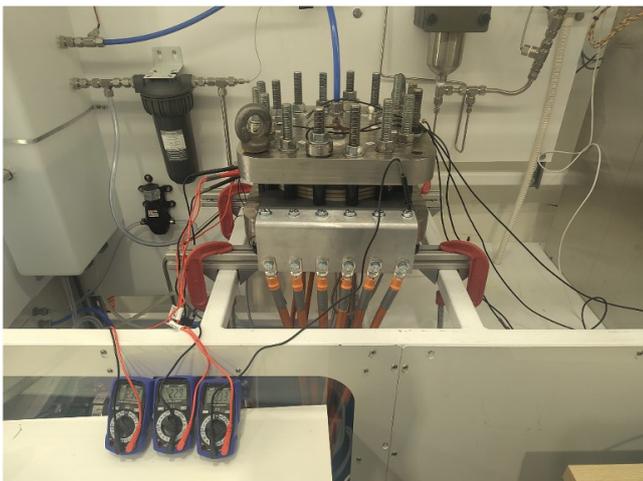


Stack assembly and testing

Significant progress has been made on both the short-stack and full-stack development. Oort designed a new stack geometry optimised for 200-bar electrolysis, ensuring compatibility for both the 3-cell short stack and the 50-cell full-stack demonstrator. The short stack underwent rigorous hydrodynamic pressure testing, successfully withstanding up to 340 bar, with only minor seal extrusion observed. A 250-bar pressure hold confirmed gasket integrity, validating the design for high-pressure operation. Factory testing of the full system will include a 250-bar proof test before shipment. Performance testing on Oort's high-pressure test stand demonstrated stable electrolysis at 100 bar over 600 hours of operation, confirming readiness for scale-up. These results provide confidence in the architecture and materials, paving the way for the 50 kW demonstrator stack. Full-stack assembly is scheduled for April, linked to the integration with the Balance of Plant. This achievement represents a major step toward delivering a robust and safe electrolyser system capable of meeting industrial hydrogen production demands.



Short stack and 50 kW demonstrator.



ADPEM stack on Oort's high pressure test stand.

Other work in progress

Preparations for system integration are advancing rapidly. Procurement of the BoP components are underway at Oort, ensuring readiness for coupling with the full-stack demonstrator. Meanwhile, site preparation activities have commenced in Niederaussem at RWE, where the final installation and testing will take place. These efforts are critical to enabling smooth deployment and commissioning in the coming months. With stack, BoP and site preparation progressing, the consortium is on track to deliver the 50 kW high-pressure electrolyser demonstrator, marking a significant milestone in the ADVANCEPEM project's journey toward completion.

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